

NOXUBEE NATIONAL WILDLIFE REFUGE  
MASTER PLAN  
PHYSICAL AND BIOLOGICAL DEVELOPMENT  
DECEMBER 4, 1961

U. S. FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE  
REGION 4

COMPILED AND PREPARED BY: BRANCHES OF REFUGES, ENGINEERING  
AND REALTY

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NOXUBEE NATIONAL WILDLIFE REFUGE

MASTER PLAN

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PHYSICAL AND BIOLOGICAL DEVELOPMENT  
OF  
NOXUBEE NATIONAL WILDLIFE REFUGE

1. Introduction

11. The Refuge

111. Geographical Characteristics

111.1 Acreage, Boundary and Location in Relation to Town and County Seat. The Noxubee National Wildlife Refuge, established by Executive Order 844, June 14, 1940, is located in east central Mississippi. Including 20.01 acres of privately owned leased land in Winston County, the refuge contains 44,798.38 acres (July 1, 1961) located in counties as follows: (Exhibit 1-A)

Noxubee	10,322.21
Oktibbeha	15,978.28
Winston	<u>18,497.89</u>
Total	44,798.38

An additional 13,848 acres, more or less, lie within the approved purchase boundary involving numerous adverse holdings within the present refuge boundary and in insets along Noxubee's irregular boundary. Proposed acquisition is being reduced as a result of master planning to 12,391 acres.

The Refuge Headquarters, located in the extreme northwest corner of Noxubee County, is within a 20 to 30 mile distance of Starkville, Mississippi, county seat of Oktibbeha County; Louisville, Mississippi, county seat of Winston County; and Macon, county seat of Noxubee County. Other nearby population centers include Columbus, Brooksville, West Point, Sturgis, and Ackerman, Mississippi. (Exhibit 1-B)

111.2 Relationship to Flyway and Other Federal Refuges. Although located administratively within the Mississippi Flyway, Noxubee is situated geographically on the eastern boundary of this flyway for Canada geese migrating the Mississippi Valley route (Exhibit 1-C). Based on the assumption that the Canada geese wintering on the Wheeler Refuge are from the so-called southeast flock whose Canadian breeding grounds range from the country drained by the Moose River, south and east to the Nottaway or Rupert River country, Noxubee should receive birds from both the Mississippi Valley population and the southeast flock.

Census data on the flyway of the southeast population are meager. Limited banding data indicate that this group of Canada geese is disassociated, to a large degree, with the Horseshoe Lake flock in the Mississippi Flyway and the South Atlantic flock of the Atlantic Flyway. However, considerable merging undoubtedly occurs in both flyways.

In the autumn migration, the range of the southeast population overlaps that of the Mississippi Valley population between James Bay and the Miner Sanctuary. At the latter point, band recoveries indicate that the birds of the southeast population split off from the Mississippi Valley birds, pass out south and southeast over a number of courses, and make few stops en route to their wintering quarters. The wintering grounds lie mainly in the Piedmont regions east and south of the Appalachian Mountains and in some parts of the Coastal Plains, including the states of Virginia, South Carolina, Alabama, Georgia and Florida. (Hanson & Smith, Canada Geese of the Mississippi Flyway, 1950)

Past observations reveal no major flights of geese pass over Noxubee. However, the refuge is within range of the major duck migration route of the Mississippi Flyway. The fact that Noxubee--with its present developments consisting mainly of two green timber reservoirs, Bluff Lake, and approximately 1,000 acres of agricultural lands--attracts from 50,000 to 100,000 ducks annually indicates that a substantial migration does occur through the vicinity.

Occasional flights of blue and snow geese stop for short periods on Noxubee during both the spring and fall migrations (Photo 1).



Photo 1 (R 5-59, Exp. 11)  
Blue and Snow Geese on Doyle Arm of Bluff Lake

In relation to other Federal Refuges, Noxubee is located approximately

150 miles southwest of Wheeler Refuge,  
125 miles northeast of Yazoo Refuge,  
150 miles southeast of White River Refuge,  
200 miles south of Tennessee Refuge,  
225 miles south of Reelfoot Refuge,  
325 miles north of Delta Refuge.

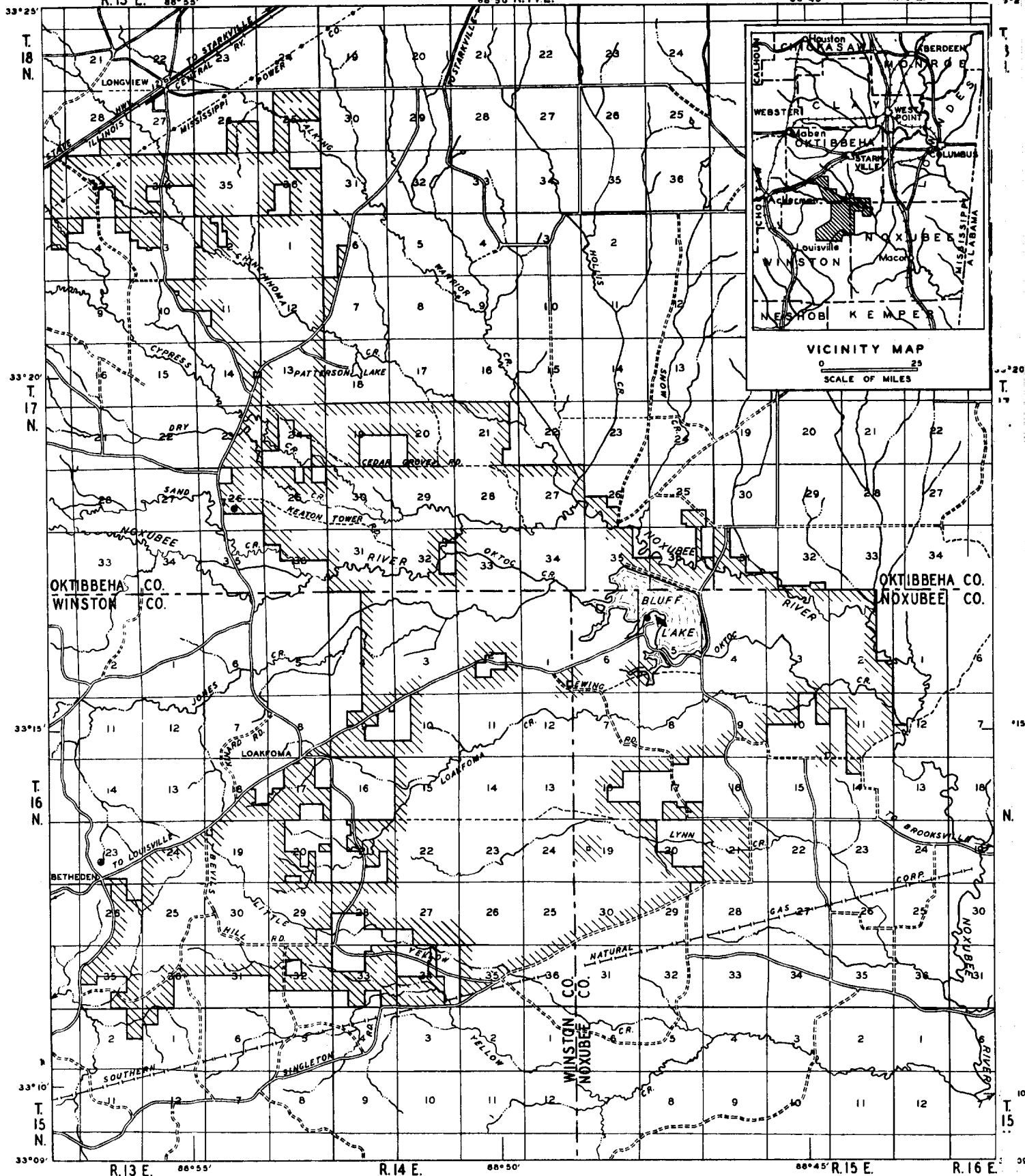
111.3 Relationship to State, Private and Commercial Refuges and Shooting Grounds. Noxubee is located in propinquity to the State's Dancing Rabbit Wildlife Management Area. Existing and proposed state waterfowl areas having a relationship with Noxubee and lying north of the refuge include Yellow Creek Waterfowl area and Arkabutla Reservoir Waterfowl and Hunting area, located in the northwest corner of Mississippi in DeSoto and Tate Counties; Sardis Reservoir Waterfowl Refuge and Hunting area, located in Panola and Lafayette Counties; Enid Reservoir Waterfowl Refuge and Hunting area, located in Panola, Lafayette and Yalobusha Counties; Grenada Waterfowl and Upland Game Management area, located in Yalobusha, Grenada and Calhoun Counties. The approximate distances of the above waterfowl units from Noxubee Refuge are 115, 90, 70 and 50 miles respectively. These units are either on or adjacent to Corps of Engineers projects. Other existing and proposed State Wildlife and Waterfowl management units are dispersed throughout the state of Mississippi (Exhibit 1-D).

The Arkabutla, Sardis, Enid and Grenada Corps Reservoirs are dispersed so as to provide stepping-stone waterfowl resting areas leading from the Mississippi River to the Noxubee Refuge. However, these areas frequently are relatively barren in respect to waterfowl food and their wintering populations of duck and geese are insignificant.

The Dancing Rabbit Wildlife Management Area consists of 100,000 acres of leased private lands. On this area the State conducts managed deer, squirrel, turkey, quail and rabbit hunts. The 38,000 acre Tombigbee National Forest in Choctaw, Winston and Oktibbeha Counties also is open each upland game hunting season.

Private and commercial refuges and shooting areas are non-existent in the Noxubee section of Mississippi. However, with the number of waterfowl on the refuge increasing each year, a limited number of private and commercial shooting areas should come into being in the future years.

## NOXUBEE NATIONAL WILDLIFE REFUGE

DEPARTMENT OF THE INTERIOR  
R.13 E. 88°55'NOXUBEE, OKTIBBEHA AND WINSTON COUNTIES, MISSISSIPPI  
88°50' R.14 E.FISH AND WILDLIFE SERVICE  
R.15 E. 88°45'

COMPILED IN THE DIVISION OF LANDS FROM SURVEYS BY  
F&W.S., S.C.S., G.L.O. AND AERIAL PHOTOS BY A.A.A.  
MARCH 1948

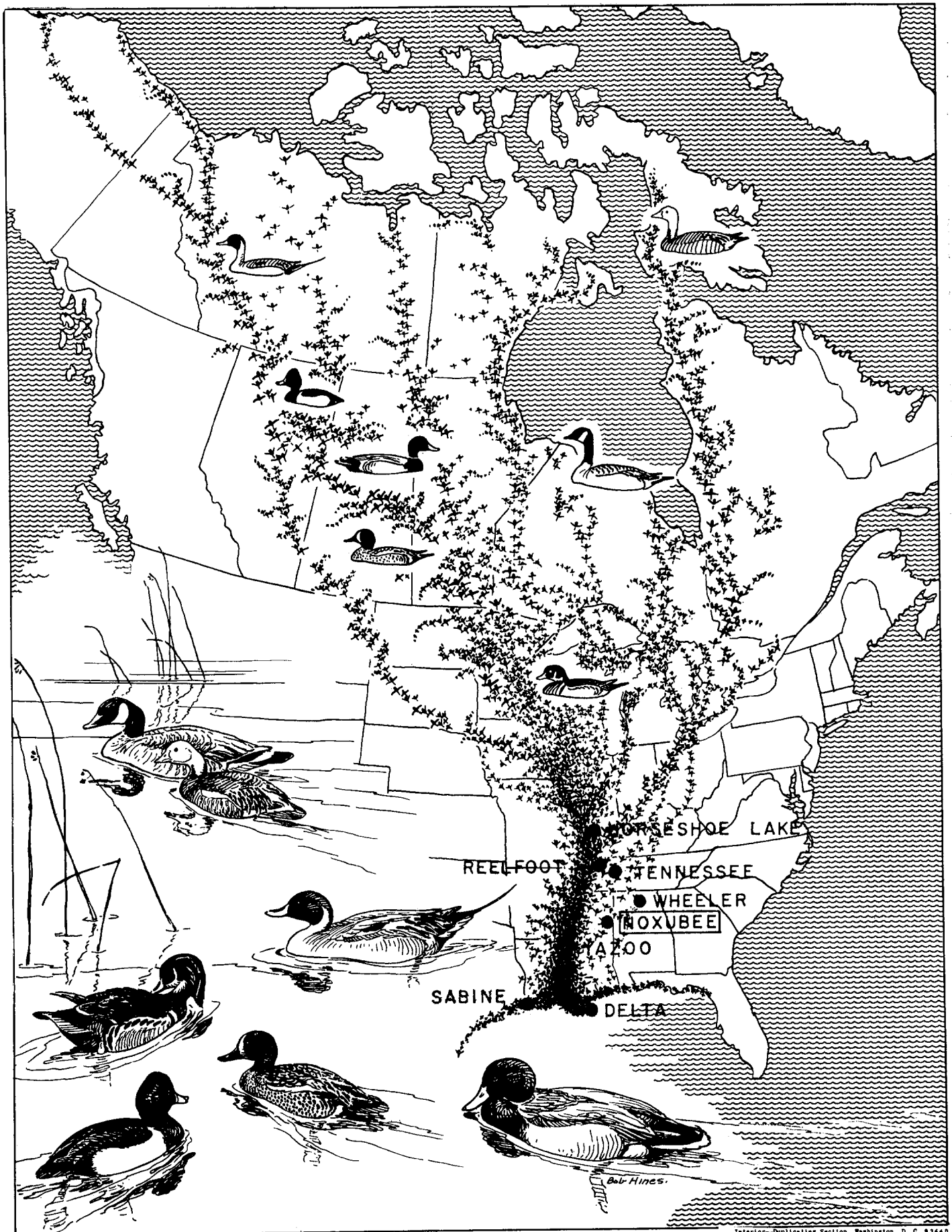
CHOCTAW MERIDIAN

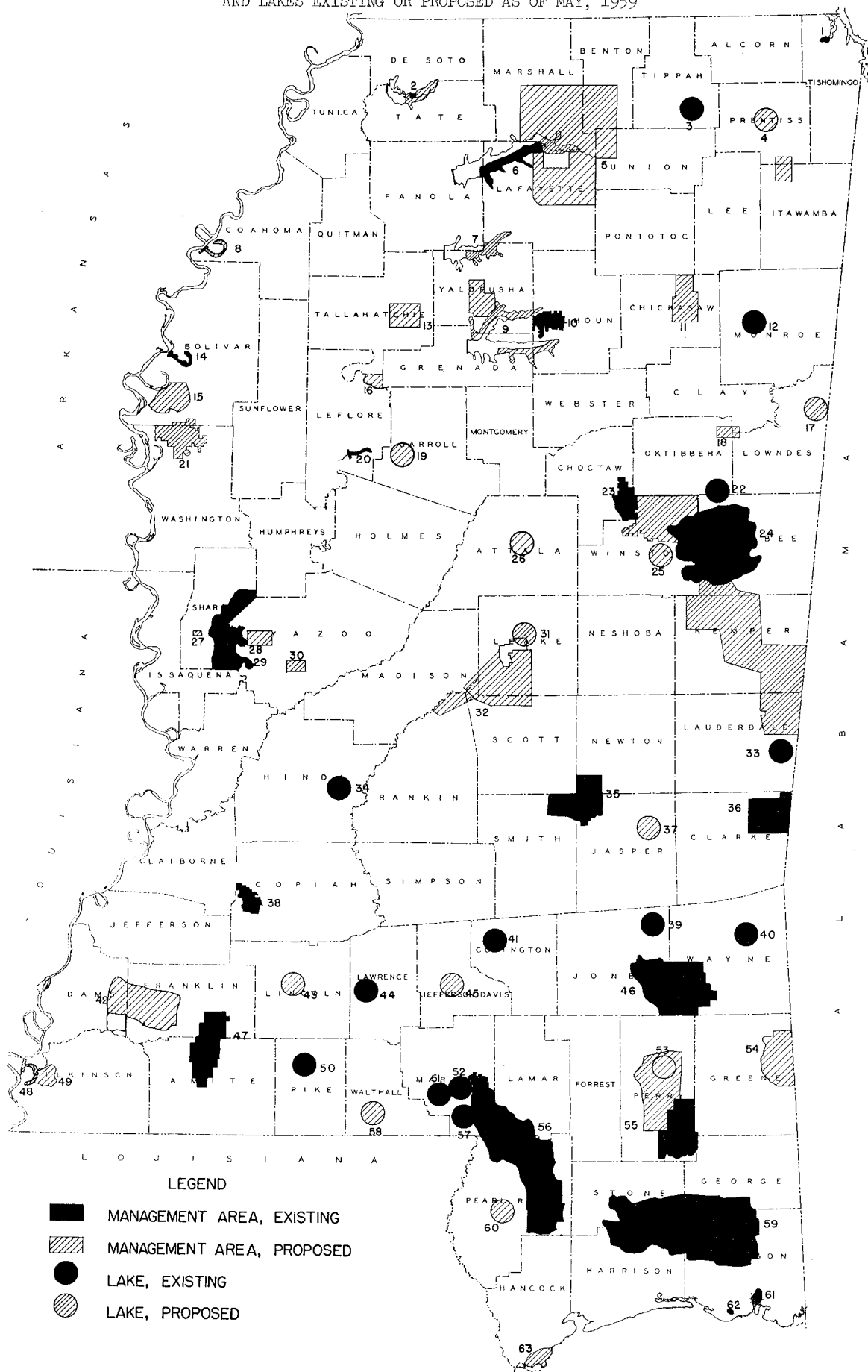
EXHIBIT 1-B

State Highway Map

The Mississippi State Highway map is included in a separate appendix to the Noxubee Master Plan.

EXHIBIT 1-C  
MISSISSIPPI FLYWAY MAP



PUBLIC WILDLIFE AND WATERFOWL MANAGEMENT AREAS  
AND LAKES EXISTING OR PROPOSED AS OF MAY, 1959

MISSISSIPPI GAME AND FISH COMMISSION

PUBLIC WILDLIFE AND WATERFOWL MANAGEMENT AREAS  
AND LAKES EXISTING OR PROPOSED AS OF MAY, 1959

1. Yellow Creek Waterfowl Area
2. Arkabutla Reservoir Waterfowl Refuge and Hunting Area
3. Dumas Lake, 35 acres - Bass, Bluegill
4. Prentiss County Lake (Proposed)
5. Holly Springs Wildlife Management Area (Proposed)
6. Sardis Reservoir Waterfowl Refuge and Hunting Area
7. Enid Reservoir Waterfowl Refuge and Hunting Area (Proposed)
8. Dam De Soto Lake Outlet
9. Grenada Waterfowl and Upland Game Management Area (Proposed)
10. Calhoun Wildlife Management Area
11. Chickasaw Wildlife Management Area (Proposed)
12. Lake Monroe, 111 acres - Bass, Bluegill
13. Land acquisition for Waterfowl Area (Proposed)
14. Dam Beulah Lake Outlet
15. Canada Goose Refuge and Management Area (Proposed)
16. Land Acquisition for Waterfowl Area (Proposed)
17. Lowndes County Lake (Proposed)
18. Land Acquisition for Waterfowl Area (Proposed)
19. Carroll County Lake (Proposed)
20. Dam Blue Lake
21. Shell Lake Waterfowl Management Area (Proposed)
22. Bluff Lake, 1200 acres - Bass, Bluegill, Crappie, and Catfish
23. Choctaw Wildlife Management Area
24. Dancing Rabbit Wildlife Management Area
25. Winston County Lake
26. Attala County Lake (Proposed)
27. Sharkey County Waterfowl Management Area (Proposed)
28. Panhandle Brake Waterfowl Management Area (Proposed)
29. Sunflower Waterfowl and Wildlife Management Area
30. Lake George Waterfowl Area (Proposed)
31. Leake County Lake (Proposed)
32. Pearl River Valley Waterfowl and Wildlife Management Area (Proposed)
33. Lake Lauderdale, 240 acres - Bass, Bluegill
34. Lake Dockery, 80 acres
35. Tallahala Creek Wildlife Management Area
36. Bucatunna Creek Wildlife Management Area
37. Jasper County Lake, 80 acres
38. Copiah County Wildlife Management Area
39. Bogue Homa Lake, 1200 acres, Bass, Crappie, Bluegill, Jack
40. Lakeland Park Lake, 12 acres - Bass, Bluegill
41. Lake Mike Conner, 80 acres - Bass and Bluegill
42. Wildlife Management Area (Proposed)
43. Lincoln County Lake (Proposed)
44. Lake Mary Crawford, 130 acres - Bass, Bluegill
45. Jeff Davis County Lake (Proposed)
46. Chickasawhay Wildlife Management Area
47. Homochitto Wildlife Management Area
48. Dam Lake Mary Outlet
49. Foster Lake Waterfowl Area (Proposed)
50. Lake Dixie Springs, 90 acres
51. Lake Columbia, 90 acres - Bass, Bluegill
52. Lake Tom Watts, 12 acres - Bass, Bluegill
53. Perry County Lake (Proposed)
54. Wildlife Management Area (Proposed)
55. Leaf River Wildlife Management Area and Proposed Expansion
56. Wolf River and Marion County Wildlife Management Areas
57. Lake (Unnamed), 3 acres
58. Walthall County Lake (Proposed)
59. Red Creek Wildlife Management Area
60. Pearl River County Lake (Proposed)
61. Big Lake Waterfowl Refuge (Closed)
62. Graveline Bayou Waterfowl Area
63. Hancock Marsh Waterfowl Area (Proposed)
64. Land Acquisition for Waterfowl Area, Prentiss and Itawamba Counties (Proposed)

## 112. Geophysical Characteristics

112.1 Topography. In general, lands of the Noxubee Refuge are relatively level to slightly rolling. The drainage is by the Noxubee River and its tributaries. The principal small watersheds with their concourses within or immediately adjacent to refuge lands include Chinchoma, Cypress, Dry, Sand, Oktoc, Jones, Loakfoma, Lynn, Yellow, Hollis, and Warrior Creeks and the Noxubee River (Exhibit 1-E - U.S.G.S. Quadrangles presently not available).

Refuge areas having the most desirable topography for development of waterfowl habitat are Noxubee River-Oktoc Creek Watershed, Jones, Loakfoma and Lynn Creeks Watersheds. The watersheds have rather broad level bottoms with approximately three feet grade per mile.

The Oktoc Creek drains through Bluff Lake, thus affording the water supply for this lake as well as for Green Timber Reservoirs 1 and 2. The elevation and topography at the major creek bottoms are such that these areas support choice stands of small mast-producing oaks and other desirable hardwoods and have excellent potentials for the development and management of green timber reservoirs for waterfowl.

The Bevil Hill section of the refuge consists of approximately 6,000 acres of steep, F slope, severely eroded, forest land containing pine-hardwood and pine plantations cover. This area lends itself best to wildlife-forestry type management.

Terrace soils adjacent to the hardwood bottoms are the areas most suitable for agriculture. These lands generally are level and erosion is insignificant. The flooding of field impoundments by rainfall run-off normally can be accomplished.

112.2 Geology and Soils. Geographically, Noxubee lies within the Interior Flatwoods section of Mississippi; however, the Flatwoods area is relatively narrow and refuge lands show influences from the formations both of the Mississippi Blackland Belt from the east and the upper Coastal Plains on the west (Exhibit 1-F).

The Blacklands' soils are high in clay content and difficult to work in cultivated crops. Many of the soils are high in lime and the area, as a whole, is best suited for a livestock system of farming being well adapted to the production of hay and pasture crops. Soils of the Blacklands nature on the refuge are most conspicuous in low areas and creek bottoms.

Soils of the upper Coastal Plains nature are generally sandy and low in fertility. However, if the topography permits, the land is suited for cultivated crops. A general type agricultural economy

exists on the upper Coastal Plains area with farm income being derived chiefly from cotton, corn, dairy products and pine timber. The higher refuge lands are somewhat characteristic of upper Coastal Plains type soils and, for the most part, support a mixed stand of loblolly pine and hardwoods.

Approximately 50 percent of Noxubee's lands has features of the Interior Flatwoods. The soils have a soapstone base subsoil with silty and sandy material constituting the top soil. These soils have poor internal and surface drainage. However, if properly surface drained and adequately fertilized, they will produce satisfactory yields of corn, grain sorghum, millets, soybeans, small grain, grasses and legumes for waterfowl food. These areas are well adapted to forest-upland game management.

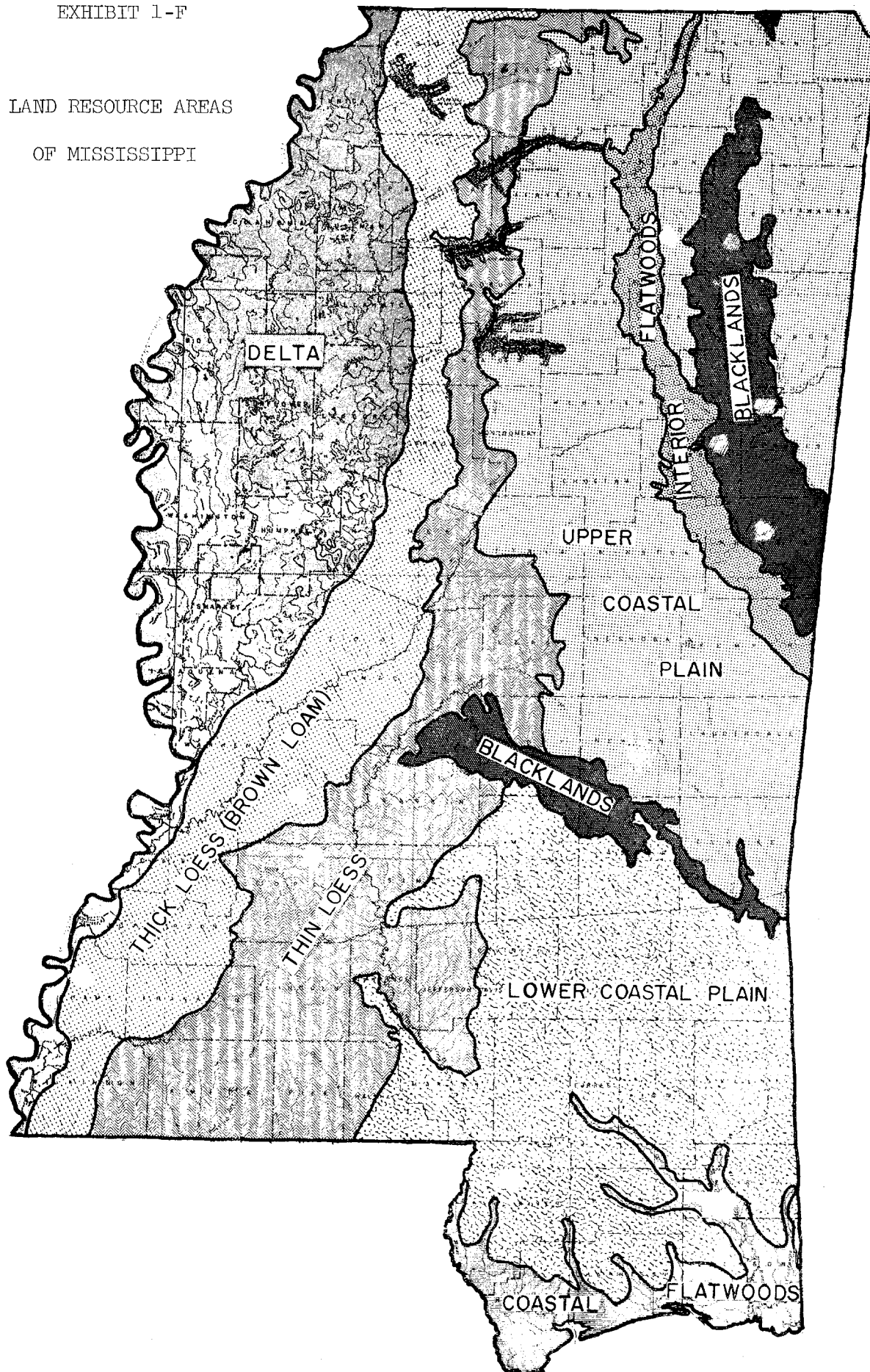
The refuge bottom lands, containing 10,000 to 12,000 acres, have a silty clay to sandy surface soil with an underlying heavy clay subsoil and support an excellent growth of small mast-producing hardwoods. These areas are adaptable to the production of hardwood timber and management for waterfowl.

The Uplands support a mixed pine-hardwood stand. However, these lands present a greater problem in management than either the flatwood or bottom areas in that the hardwoods are of a poorer quality and reproduction of undesirable species more rapid.

Areas of the refuge best suited for the production of agricultural crops for waterfowl are those relatively level lands of slightly higher elevation adjacent to the hardwood bottoms. These lands are predominantly class II, III and IV soils. Water movement is slow both externally and internally. Due to silty clay or hard-pan type subsoil, the soils are extremely wet during periods of excessive rainfall and droughty during periods of low rainfall. Adequate surface drainage is of major importance for the production of agricultural crops.

EXHIBIT 1-F

LAND RESOURCE AREAS  
OF MISSISSIPPI



113. Climatological Characteristics.

Records reveal practically no consistency with reference to precipitation by months. However, the average annual precipitation of 51 inches is fairly consistent. Rainfall normally is highest in March, averaging 6.22 inches, and lowest in October, with an average of 2.38 inches (Exhibit 1-G). Although temperatures may range from sub-zero to 105 degrees F., the normal range is from a low of 16 to 20 degrees F. in January and February, to a high of 96 to 100 degrees F. in June, July and August. The average mean temperature by months ranges from 44.7 degrees F. in January, to 81.3 degrees F. in July (Exhibit 1-G).

Wind velocity and direction are erratic and are of importance only in a broad sense. Extreme velocities, 40 mph, normally are of short duration (8-10 hours). Wind movement and water evaporation in relation to rainfall are greatest in June through October and, at times, render relatively dry conditions during these months (Exhibit 1-G). Noxubee is located in the tornado belt and storm warnings are prevalent. Tornado damage on the refuge and general vicinity is not uncommon.

In addition to the average annual rainfall of 51 inches, the chief source of water supply for the Noxubee Refuge is Noxubee River and its main tributaries: Jones, Oktoc, Loakfoma, Cypress and Dry Creeks. The mean annual flood of the Noxubee River at the Brooksville gauge has been computed to be 9,800 cfs at a stage of about 20 feet. Bankfull stage at this location is approximately 15 feet. The general direction of water flow is from northwest to southeast.

Although neither drought or excessive rainfall conditions are uncommon, climatic conditions in the Noxubee section of Mississippi are considered conducive to the development and management of waterfowl habitat. Due to the long-growing season, the production of summer grains and forage crops for wildlife use can be accomplished between the months of March and October, inclusive. The flooding of field impoundments and green timber reservoirs by rainfall run-off normally is successful by the latter part of December. However, storage water is needed to guarantee successful utilization by waterfowl of such improvements.

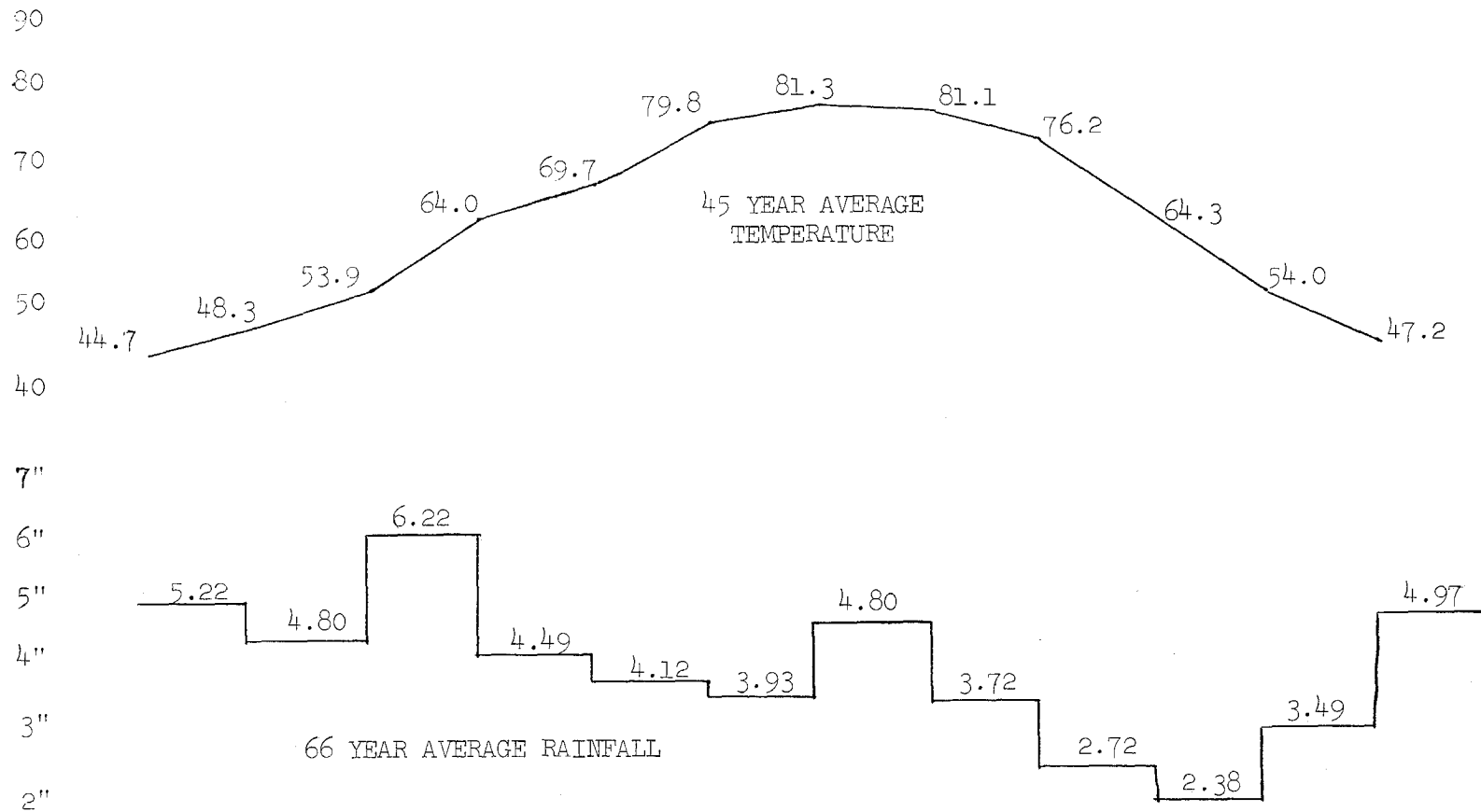
Climatic conditions are not altogether "rosy" as both late winter and spring floods and extreme droughts have been costly at times. Water has gone over Bluff Lake Levee on several occasions, rendering considerable damage and drought conditions often reduce crop yields. During the primary crop-growing and maturity seasons, two to three weeks of hot and drying weather will sometimes burn crops beyond recovery.

EXHIBIT 1-G  
Weather Data

JAN. FEB. MARCH APRIL MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

NOXUBEE NATIONAL WILDLIFE REFUGE

Data from State College, Miss. Weather Station



## EXHIBIT 1-G (Continued)

## NOXUBEE N.W. REFUGE

## DATA FROM BLUFF LAKE WEATHER STA. (RAINFALL ONLY)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	YR.
1948	4.75"	7.37"	7.79"	4.45"	--	3.27"	3.28"	3.98"	6.97"	0.13"	14.17"	7.12"	63.2"
1949	13.70	6.47	6.33	2.34	4.70	4.53	5.01	3.87	2.84	5.23	0.67	3.96	49.6
1950	11.29	7.96	--	2.40	4.26	2.60	6.74	6.29	6.13	3.16	2.74	2.96	56.3
1951	--	2.97	11.49	4.28	2.42	4.53	--	1.83	2.97	1.49	3.79	7.23	43.0
1952	3.87	2.86	3.68	3.71	3.43	0.25	0.14	1.50	2.38	0.10	3.18	4.22	29.3
1953	7.36	7.93	4.63	6.95	5.34	4.44	7.99	1.58	1.29	0.46	0.81	6.70	55.4
1954	6.87	1.76	2.47	4.48	4.07	0.49	4.10	1.13	0.77	2.46	3.10	3.43	35.1
1955	4.20	6.68	3.32	5.32	6.06	1.96	6.86	3.21	0.20	0.97	5.17	0.96	44.9
1956	2.06	10.44	5.04	5.91	2.97	2.30	2.86	2.39	2.36	9.53	0.89	8.70	55.4
1957	5.98	4.04	3.81	3.11	3.55	6.43	3.60	0.69	6.85	2.94	7.99	2.64	51.6
1958	2.74	4.05	3.57	6.08	4.28	4.06	9.40	1.59	2.78	2.20	4.27	1.23	46.2
1959	3.83	4.50	4.94	4.38	6.49	1.50	3.73	3.97	2.50	3.38	2.88	3.00	45.1
ANNUAL AVERAGE													47.9

## EXHIBIT 1-G (Continued)

## NOXUBEE N.W. REFUGE

TOTAL EVAPORATION  
&  
WIND MOVEMENTDATA FROM  
STATE COLLEGE, MISS.  
WEATHER STATION

YEAR		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL
1949	EVAP.	2.10	4.11	4.55	5.59	8.04	7.29	7.21	6.44	5.70	3.59	3.99	2.35	60.96
	WIND	2456	1905	2905	2570	2002	1492	--	--	--	--	1998	1995	--
1950	EVAP.	2.65	2.88	5.59	5.73	7.32	7.55	7.73	6.86	--	3.61	2.81	1.58	--
	WIND	2893	2176	2826	2143	1457	1446	1116	737	881	897	2184	1735	--
1951	EVAP.	--	--	--	6.26	8.47	7.47	7.50	8.80	6.68	4.82	2.63	--	--
	WIND	3016	--	3166	2819	1742	1095	599	823	1350	1325	2278	3092	--
1952	EVAP.	241	3.23	5.24	5.91	7.74	10.39	10.30	7.60	7.06	5.61	3.50	2.27	71.26
	WIND	--	2512	2861	2430	1708	1367	1203	848	1261	1790	2120	2019	22702
1953	EVAP.	--	--	4.30	6.67	7.66	8.13	7.35	--	7.75	5.72	3.71	--	--
	WIND	--	2093	2037	2744	1586	898	816	920	1147	1081	1595	3032	--
1954	EVAP.	--	4.58	5.60	5.60	5.75	9.11	9.38	11.62	8.10	5.36	3.29	2.37	--
	WIND	--	3033	2653	1704	1486	1293	1494	1778	1463	1765	1835	2632	23654
1955	EVAP.	1.86	2.48	4.96	6.42	7.71	7.44	6.64	7.40	6.43	5.59	3.70	2.45	63.08
	WIND	--	2784	3126	2255	1686	1412	1108	1073	1044	1765	2086	2048	22676
1956	EVAP.	2.41	3.03	5.11	5.74	7.10	7.36	9.67	8.37	7.63	4.44	3.35	2.31	66.52
	WIND	--	2586	2540	2056	1432	1288	1440	1104	1236	1007	1670	1900	20693
1957	EVAP.	1.73	2.86	3.71	5.98	6.63	6.65	7.28	8.43	4.47	3.46	2.78	2.37	56.35
	WIND	--	1536	1852	1674	1282	1112	814	1019	1112	1361	1623	2016	17345
1958	EVAP.	2.00	4.73	3.13	5.22	6.67	6.74	6.87	6.78	5.05	4.31	2.81	1.91	56.22
	WIND	--	1911	1717	1358	1186	1040	925	833	964	1105	1344	1373	15625
1959	EVAP.	2.17	2.80	5.20	5.69	6.94	7.01	7.77	7.87	5.45	3.75	2.87	2.24	59.76
	WIND	--	1685	1773	902	633	495	772	1056	1230	1383	1487	1879	15163

EXHIBIT 1-G (Continued)

NOXUBEE N.W. REFUGE  
TEMPERATURE AND FREEZE DATA  
DATA FROM STATE COLLEGE, MISS. WEATHER STATION

YEAR	HIGHEST	DATE	LOWEST	DATE	LAST SPRING MIN. OF			FIRST FALL MIN. OF			NO. OF DAYS		
					24° OR BELOW	28° OR BELOW	32° OR BELOW	32° OR BELOW	28° OR BELOW	24° OR BELOW	24°	28°	32°
1948	102°	7-8	9°	1-18	3-13,24°	3-13,24°	3-29,31°	10-18,29°	12-26,23°	12-26,23°	288	288	203
1949	96	8-12	16	2-1	2-1,16°	3-16,28°	3-19,30°	11-1,31°	11-19,27°	12-16,20°	319	248	227
1950	95	6-18	10	11-25	--	3-14,28°	4-15,32°	11-5,30°	11-11,26°	11-12,24°	--	242	204
1951	102	8-30	-1	2-3	2-8,20°	3-14,28°	3-20,29°	11-3,22°	11-3,22°	11-3,22°	268	234	228
1952	105	7-29	--	--	1-30,22°	1-30,22°	3-17,32°	10-21,32°	10-30,28°	--	--	274	215
1953	102	6-19	17	12-18	--	2-18,28°	4-21,32°	11-6,31°	11-28,28°	12-17,22°	--	283	199
1954	104	8-8	20	11-3	3-4,24°	3-16,27°	3-17,32°	10-30,32°	11-3,20°	11-3,20°	244	232	227
1955	97	8-22	15	12-16	3-27,19°	3-27,19°	3-29,31°	11-4,29°	11-28,24°	11-28,24°	246	246	220
1956	100	8-7	22	1-9	1-17,22°	3-20,27°	3-21,30°	11-9,28°	11-9,28°	11-30,23°	318	234	233
1957	98	8-15	14	1-17	1-19,22°	1-19,22°	3-8,29°	10-28,31°	12-1,27°	12-11,21°	326	316	234
1958	95	8-6	10	2-17	2-20,18°	2-21,25°	3-21,31°	11-27,32°	11-29,21°	11-29,21°	282	281	251
1959	97	8-7	11	1-5	1-25,24°	2-22,27°	3-23,32°	11-7,26°	11-7,26°	11-7,22°	259	248	248

114. Biological Characteristics.

The complexity of the zoogeographic affinities of the Noxubee National Wildlife Refuge defies superficial classification or arbitrary categorization. The faunal relationships of the area are rendered apparent only upon examination from a number of different viewpoints. Geographic locality complicates efforts to classify the area's fauna, since Noxubee is located on the periphery of several rather distinct faunal regions. Cooper (1859) recognized this problem in his system of Natural Provinces and Regions in drawing his line separating the Mississippian and Tennessean Regions of the Appalachian Province through the area that now is Noxubee. This pattern places Noxubee in a transition zone, thus bringing together a mixed fauna and flora. Hence, while Noxubee is a part of the wide-spread Temperate Deciduous Forest, it is in reality an area of mixed vegetational types, as indicated by Pitelka (1940) when he included it in the Deciduous Forest-Southern Pine Biome. The resultant mixing of faunae is illustrated in considering genera of mammals, with respect to their zoogeographic origins, for only 56% of those present are associated with the Austral N. American Fauna, while 11% are Eurasian, 17% Panboreal, 5% Boreal North American, 5% Tropical North American and 5% South American (Gordon).

Many of the schemes proposed in the past have been too inaccurate to be meaningful with respect to the area included by Noxubee. Thus, Drude (1887) erroneously included it in the Long-leaf Pine Forest. Many other systems have been more useful but have had obvious shortcomings and imperfections. Allen (1892) placed the area in the Louisianian Faunal area of the Sonoran Province. Merriam considered the area in his Austroriparian Subprovince. Both of these schemes fail to take into account faunal differences existing between the Coastal Plain and the area further inland. Although the typical coastal fauna is not strongly represented at Noxubee, certain typically Coastal species are present; e.g. Siren intermedia (Eastern dwarf siren). Invaders from the Appalachian Plateaus; e.g. Plethodon cinereus dorsalis (zig-zag salamander) and the Central Plains; e.g. Chrysemys picta (painted turtle) also are to be found.

The systems that seem to most accurately represent the area and express the conditions existing there are those of Kendeigh (1954) and Pitelka (1941). Kendeigh's biome scheme considers the Noxubee area as a Deciduous-Forest Edge Biocies, representing an ecotone between the Deciduous and Southern Pine Forests. Pitelka calls the area an Oak-Pine Subclimax.

The following assemblage of vertebrates is a partial list of species occurring within the Noxubee Refuge; and for the most part, the known range for these forms fringes the area exemplifying its ecotonal characteristics: Peromyscus gossypinus (cotton mouse), Reithrodontomys humulis (harvest mouse), Peromyscus nuttalli (golden mouse), Oryzomys palustris (rice rat), Sigmodon hispidus (cotton rat), Neotoma floridana (wood rat), Pitymys pinetorum (pine mouse), Sylvilagus aquaticus (swamp rabbit), Macrochelys temmincki (alligator snapper), Anolis carolinensis (Carolina anole, american chameleon), Haldea striatula (brown snake), Farancia abacura (mud snake), Cemophora coccinea (scarlet snake), Tantilla coronata (crowned snake), Agkistrodon piscivorus (water moccasin), Amphiuma tridactylum (three-toed Congo eel), Ambystoma talpoideum (mole salamander), Hyla cinerea (green tree frog), Acris gryllus (cricket frog), Hyla avivoca (bird voiced peeper), Rana areolata (gopher frog).

Certain genera which have not been recorded for Noxubee are conspicuous by their absence. In this category are such genera as Microtus (meadow mole), Zapus (jumping mouse), Geomys (pocket gopher), Micrurus (coral snake), Cryptobranchus (hell bender), Aneides aeneus (green salamander), Cottus (sculpin) and others.

115. Community Characteristics.

Starkville, Louisville and Macon are the county seats of Oktibbeha, Winston and Noxubee Counties, respectively. Starkville is located approximately 20 miles north of Noxubee Refuge. The present (1961) population is about 10,000, with commercial bus transportation being the only passenger service into the city. One airport in Starkville can handle planes up to the DC-3 and other similar twin-engine size aircraft. However, no scheduled flights stop in Starkville. The Illinois Central and the Gulf, Mobile and Ohio railroad lines service Starkville both in incoming and outgoing freight.

Starkville has two grammar schools and one high school for white students, and one grammar school and one high school for Negro children. The Mississippi State University, a land-grant college, is located in Starkville and has a current enrollment of approximately 5,000 students. The School of Science, including Botany, Zoology and Game Management; the School of Forestry and the Mississippi Agricultural Experiment Station are readily accessible for use by refuge personnel in problems of soils and related sciences.

The city's medical facilities include one hospital and the State University Clinic with a combined capacity adequate for 500 bed patients.

Concerts, symposiums, stage productions and other educational and cultural events that take place at Mississippi State are open to the public. Starkville has two motion picture theaters, one public swimming pool, several tennis courts and other similar recreational facilities, including two bowling lanes.

Louisville is located 25 miles west of the refuge and has a population of 7,000. The city's transportation facilities include one commercial passenger bus line and the G.M.&O. rail freight line. The Winston County Hospital is located in Louisville and has a 200 patient capacity. School facilities include one elementary and one high school for white children and one elementary and one high school for Negroes.

One motion picture theater is located in Louisville, and a large lake for public swimming and fishing is located nearby.

Macon is a small town with a population, including nearby Brooksville, of approximately 3,000, and is located 28 miles southeast of the refuge. Transportation services include one commercial bus line and one railroad that accommodate both passengers and freight.

The Noxubee County Hospital, which has a 150 patient capacity, is located in Macon. School facilities include one elementary and one high school for white students and one elementary and one high school for Negro students. Recreational facilities are insignificant.

Columbus, located 35 miles east of Noxubee, offers the nearest commercial passenger plane service. Columbus, with a population of 23,000 is the largest city in the Noxubee vicinity and has almost all the facilities normally found in other metropolitan areas in addition to the Mississippi State College for Women, with a current 800-student enrollment.

The sub college-level schools serving the Noxubee vicinity probably are average in comparison with other Mississippi schools.

A variety of churches is located within a 20 or 30 mile radius of Noxubee, representing the more common denominations.

The Noxubee Refuge is a popular attraction with the local populace and draws a considerable number of visitors from the surrounding towns, including Columbus.

## 12. Objectives of the Refuge

### 121. Introduction.

The Noxubee National Wildlife Refuge was established by Executive Order 8444 on June 14, 1940, reserving lands acquired by the Rural Resettlement Administration as a refuge and breeding ground for migratory birds and other wildlife. The Migratory Bird Treaty Act, Migratory Bird Conservation Act and Migratory Hunting Stamp Act are the basic authorities for management of the Noxubee Refuge to protect and preserve the migratory birds leading to the annual provision of an adequate residual brood stock to perpetuate and increase the resource.

The primary objective of management is to provide adequate wintering habitat and protection for a basic breeding stock of Canada geese, dabble ducks, diving ducks and coots.

The secondary objectives include the development of optimum habitat conditions for deer, turkey and other forest game species through proper land use management including the refuge's extensive timber resource. Additional objectives involve the provision for public enjoyment of migratory birds, fishery and other wildlife resources through public hunting and fishing when surplus populations exist, and through encouragement of other compatible recreational activities.

The Noxubee Refuge has undergone several boundary and acreage changes since its establishment. Within its present boundaries, the refuge consists of 44,778.37 acres plus 20.01 acres of leased lands. Additional areas approved for acquisition account for 13,848 acres. However, the presently approved acquisition boundaries are being altered as a result of Master Planning. Deleting the lands designated as available for transfer and including all lands within the "new" acquisition boundary, the total area accounts for 55,927 acres.

Rural Resettlement Administration acquired the bulk of Noxubee Refuge lands under authority of:

Title II of NIRA, approved 6-16-38 (48 Stat. 200)

Emergency Appropriation Act of 1935, approved  
4-8-35 (49 Stat. 115)

Title III of Bankhead-Jones Farm Tenancy Act,  
approved 7-22-37 (50 Stat. 522, 525)

Executive Order 7908, dated June 9, 1938, transferred all lands acquired by the United States under Title II of NIRA and the Emergency Appropriation Act of 1935 to the Secretary of Agriculture for use, administration and disposition in accord with Title III of the Bankhead-Jones Farm Tenant Act.

Public Land Order 205, dated January 27, 1944, modified the boundary established by Executive Order 8444. It added lands, which were acquired by the three acts above and thought to be suitable for wildlife, and eliminated lands requested by the Soil Conservation Service. Public Land Order 401, dated August 19, 1947, modified the refuge boundary in the same manner.

Executive Order 8444 also conveyed lands under authority of the Act of June 25, 1910, c 421, 36 Stat. 847, as amended by the Act of August 24, 1912, c 369, 37 Stat. 497. Essentially, this act authorized the President to temporarily withdraw lands from the public domain for certain public purposes. Thus, public domain lands within the boundary of the Executive Order were included in Noxubee Refuge.

Since the beginning of the refuge in 1940, most additional land acquired has been by authority of Title III of the Act approved June 15, 1935 (49 Stat. 382) which authorized acquisition of land for refuge purposes by exchange.

A smaller amount of lands has been acquired by purchase, with approval of the MBCC, by authority of the Migratory Bird Conservation Act of February 28, 1929 (45 Stat. 1222).

## 122. Summary of Wildlife Use and Management Objectives

### 122.1 Ducks.

Use (1951 - 1961). Annual duck day-use with present refuge developments amounts to approximately 3,000,000, with a peak population in excess of 100,000 birds, involving most species using the Mississippi Flyway. Peak populations ranged, during the ten-year period, from 11,000 in 1950 to 105,000 in 1961, with mallards accounting for one-half to three-fourths of the duck-day usage and American widgeons, ring-necks, wood ducks and scaup following in that order. Abrupt increases in duck numbers occurred in 1955 and 1958 with construction and activation of Green Timber Reservoirs 1 and 2 respectively. The population increased from a previous high of 63,820 in 1958 to 105,000 in 1961 with no significant change in management.

Management Objectives. Primary management objective is to provide adequate wintering habitat for a peak population of 200,000 birds and 15,000,000 duck-days of use through management of green timber reservoirs and, to a lesser extent, by agricultural means.

Management objectives for wood ducks are to increase the present breeding population of 1,200 to 2,400 birds, improve nesting conditions by erection of nesting boxes and maintenance of natural nesting sites, and reduce brood mortality. The production objective is for 800 broods with an average of 5 flight age birds per brood.

#### 122.2 Canada Geese.

Use (1951 - 1961). The present goose use on the refuge consists of a captive flock of birds-of-the-year transplants and a small number of this species wintering on the refuge. The goose populations wintering on Noxubee have been small with peak numbers being erratic and ranging from 0 in 1952, 150 for one day in 1954, to 102 wintering on the refuge in the 1960-61 season. The birds-of-the-year transplant program is in effect with shipments of 100 birds each having been received in the falls of 1959 and 1960, and a third shipment scheduled for 1961.

Management Objectives. Management plans are directed towards the establishment and maintenance of a wintering flock having a peak population of 35,000 birds with approximately 3,000,000 Canada goose use-days.

The primary objective is the restoration of the Canada goose migration to the southern portion of the Flyway through management of the existing refuge flock and by birds-of-the-year transplants.

#### 122.3 Coots.

Use (1956 - 1961). Coot peak populations for the five-year period have ranged from 7,000 in the early seasons of 1956 and 1957 to a low of 2,000 in the fall of 1960. Use days varied from a low of 101,065 during the 1959-1960 season to 831,820 for the 1957-1958 season. No production occurs on Noxubee.

Management Objectives. The present coot use is confined primarily to Bluff Lake (1,200 acres). With the additional impoundment planned on Loakfoma Creek to increase by 615 acres the refuge's coot habitat, the migratory population of this species should account for 500,000 use-days, this being our management objective.

#### 122.4 Big Game.

Use (1956 - 1960). The white-tailed deer account for the only species of big game on the refuge and they presently are found in harvestable numbers. Deer census data on Noxubee are not considered sufficiently accurate for a scientific appraisal. However, the number of deer using the refuge is increasing annually and the current (1961) estimate is 1,000 animals including 400 fawns or yearlings and 600 breeders with a potential production of 450 fawns in a normal breeding season. Production estimate is based on a 40% buck population and a 1.5 per doe fawn crop having a four-fifths survival rate.

Management Objectives. Production objectives shall be to increase the deer population to one deer per 40 acres excluding the current fawn crop with the total number not exceeding one deer to each 25 acres. Under the present refuge land ownership, such a population would be approximately 1,800 animals. This number should increase as the land acquisition program progresses. Deer habitat will receive due consideration through the management of lands for timber, waterfowl and provision of upland game open areas in critical locations.

#### 122.5 Upland Game.

Use. The estimated average, peak and low populations of upland game species for the five-year period 1956-1960 are as follows:

	<u>Average</u>	<u>Peak</u>	<u>Low</u>
Eastern Turkey	212	250	100
Squirrel	46,200	75,000	15,000
Rabbit	36,200	55,000	8,000
Quail	1,450	2,000	800

The production objective for turkey shall be to increase the present population to 600 or more birds, provided such can be accomplished through the management of the area for waterfowl and timber, including a small number of upland game plots in the most critical locations.

Management Objectives. The land use management of Noxubee for squirrel, rabbits and quail will be incidental to the management for waterfowl, turkey and deer, and production goals are for populations that will utilize fully available habitat under these conditions. An exception is that consideration will be given to an adequate number of den trees for squirrel in our Timber Management Program.

## 122.6 Fur-bearers.

Use (1956 - 1960). Population estimates indicating average, peak and low periods for various fur-bearing animals on the refuge are as follows:

	<u>Average</u>	<u>Peak</u>	<u>Low</u>
Beaver	920	1,000	800
Fox, grey	1,000	1,000	1,000
Fox, red	320	500	200
Opossum	200	200	200
Otter	14	25	10
Mink	140	200	100
Muskrat	1,360	2,000	800
Raccoon	2,000	2,000	2,000
Skunk	100	100	100

Management Objectives. The only fur-bearing species (excluding beaver) of commercial value are mink, otter and muskrat, and these are not present on the refuge in sufficient numbers for profitable harvests. Present or potential refuge habitat is insufficient for these animals to become of economic importance in the refuge program. Production objectives do not dictate specific habitat improvements, and population goals are for a reasonable increase for mink and otter and a status-quo for muskrats.

With the exception of mink, otter and muskrats, fur-bearers should be considered predators or pest animals. Production objectives are for the maintenance of species' populations at levels which will not interfere with accomplishments of the primary management objectives.

An effort will be made to reduce the refuge's beaver population to a point compatible with forestry and wildlife management through a trapping program and by other means.

## 123. Management Program

123.1 Water Management. In addition to Bluff Lake (1,200 acres), an increased acreage of permanent water (Loakfoma Impoundment, 615 acres) is essential. Permanent waters will be managed as feeding and resting areas for both ducks and geese.

To attain the productive objective of 15,000,000 duck-days of use, management, with the necessary TSI work, must include a 3,000 acre minimum of green timber reservoirs.

Water management also must include flooding from storage reservoirs and by rainfall of agricultural crops in both permanent and temporary

field dewatering impoundments. The flooding of field impoundments is necessary since several of the agricultural fields planned for waterfowl food production are not in propinquity to permanent water areas.

123.2 Land Management (Agricultural). With completion of land acquisition, development and attainment of wildlife objectives, a minimum of 3,000 acres of agricultural land will be required for the production of waterfowl food. Agricultural waterfowl habitat serves a dual purpose by benefiting greatly deer and turkey, and with such areas involved, approximately 5% of the total refuge area should be maintained as arable lands, including upland game plots, field roads and right-of-ways for upland game. Primary consideration must be employed in the management of the refuge's agricultural land for Canada geese at such a time that the flock reaches the stated objective of 35,000 birds. If agricultural land development progresses more rapidly than the waterfowl use of agricultural land, the major farming efforts should be through a Cooperative Farming Program whereby the farmers harvest a major portion (approximately 75%) of the crops produced. Farming by refuge personnel should be governed by the current waterfowl demands.

123.3 Land Management (Timber). The refuge hardwood bottom lands, including green timber reservoirs, shall be managed for optimum timber production insofar as possible with primary emphasis being placed on waterfowl habitat improvement and maintenance. Timber-stand-improvement work and harvests are planned to enhance the growth and density of small mast-producing oak and other desirable species.

Upland timbered areas will be maintained chiefly for pine production with a management that will enhance food production and cover for upland game and deer. Hardwood "patches" and an adequate number of mast-producing trees will be excluded from TSI work to satisfy wildlife demands.

Relatively small open areas for combined forestry and agricultural management to benefit game species will be dispersed throughout timbered areas.

#### 123.4 Public Use Objectives.

Recreation. Provision is recommended for free public fishing on the refuge's permanent impoundments when not in conflict with waterfowl management. Public uses in forms of fishing, picnicking, sightseeing and similar usage will be encouraged through the provisions of recreational areas, sightseeing tours and cooperation with local schools and youth groups, civic organizations and other interested individuals or groups.

Public Hunting. Annual public hunts presently are conducted on Noxubee for deer and upland game including turkey (spring gobbler hunt), squirrels, rabbits, bobcats, foxes and crows. These hunts will be continued so long as populations of these species do not fall below the present levels.

Provision for public hunting on the refuge for ducks is planned when additional green timber reservoirs on Oktoc Creek are completed.

Canada goose hunting on Noxubee is not foreseen for the immediate future. However, when a sizable refuge goose flock is established and if an adequate harvest is unattainable on nearby privately owned lands, consideration should be given to the public hunting of geese on the refuge.

123.5 Wildlife Management Studies and Applied Research. The changing conditions demand that attention be exercised toward refuge biological problems, experimentation and implementation of new techniques. Studies and research are needed on the following items:

Methods of re-establishing the Canada goose flights to the southern portion of the Flyway including an evaluation of the present three-year transplant program involving birds-of-the-year.

Waterfowl ecology and food utilization of green timber reservoirs.

Regeneration of desirable mast-producing hardwoods in green timber reservoirs, and water management in relation to sustained yields of mast.

Methods of improving and maintaining density and quality of aquatic and wet soil food plants in permanent impoundments.

Improvement of nesting conditions for wood ducks, including erection of predator-proof nesting boxes and reduction of brood mortality.

Development of practical control of beaver populations to prevent serious timber losses caused by summer flooding.

Improvement of wildlife censusing methods for waterfowl utilizing timbered areas, deer and turkey.

Physical condition of waterfowl in relation to existing food conditions.

Methods of fulfilling banding quotas as prescribed in the continental banding plan.

Refuge management plans call for the initiation of a burning program on upland pine. The burning program is designed to improve the forest floor for wildlife cover and food production, reduce the wildfire hazards, decrease reproduction of undesirable hardwoods and facilitate pine reproduction.

Fish management studies on the permanent impoundment should include further study in rough fish control techniques.

124. Role of Refuge in Mississippi Flyway Management Plan.

Objectives of the Mississippi Flyway Management Plan that will be met by the proposed development and management of Noxubee Refuge include:

Provision of a sanctuary for migratory waterfowl for preservation and enlargement of the resource (primarily a wintering ground).

Preservation of existing wetlands for waterfowl.

Restoration of the Canada goose migration to the southern portion of the Flyway through management of the existing refuge flock and by "birds-of-the-year" transplants.

Provision for additional Canada goose habitat to attract surplus geese from Wheeler Refuge as a means to relieve a potential depredation problem that might occur.

Dispersion of waterfowl populations within the Flyway to provide hunting opportunities for an increased number of hunters.

13. Refuge Staff.

Noxubee is a relatively large refuge. The area, presently, comprises 44,798 acres (including 20 acres of leased lands) and an additional 12,391 acres within the approved purchase boundary. Noxubee is one of few refuges that requires intensive management of practically every acre. Land use is complex inasmuch as it involves intensive management of water areas, agricultural land, green timber reservoirs, and timber lands including bottom land hardwoods, pine and mixed pine-hardwood timber.

Noxubee primarily is a waterfowl refuge with the responsibility of wintering a large concentration of ducks including almost all species using the Mississippi Flyway and involving both field feeding and diving ducks.

In addition to the refuge's importance as a wintering, feeding, and resting area for ducks, one of the primary objectives is to establish and maintain a sizable wintering flock of Canada geese. The goose program presently is in effect as a participating refuge in the Canada goose transplant program and with annual increases in the wintering population being significant, percentage-wise.

Noxubee supports harvestable populations of both deer and turkey as well as several other species of upland game animals that increase the complexity of refuge management. Public hunts are conducted on the refuge for turkey, deer, squirrels, rabbits, bobcats and foxes. Hunts in the future are expected to include waterfowl.

Timber is managed to benefit both upland game and waterfowl as well as being an important source of revenue requiring a systematic harvest of approximately 3,000,000 board feet annually. With intensive management, timber production will be increased in excess of 100%.

Agricultural soils on Noxubee mainly are of a sub-marginal type resulting from poor drainage, overflows, hardpans, low fertility, thin topsoil and hazards caused by impounded water. Farming operations require personnel having applicable knowledge of approved agricultural practices and conservation measures.

The local people are expected to draw heavily on the experience and knowledge of the refuge staff for technical information in future private development and management of waterfowl hunting grounds. Mississippi State College, located in

Starkville, offers a B.S. degree in Wildlife Management and the refuge often is used as a laboratory in teaching various phases of Wildlife Management. Students also use the refuge in conducting "Special Problems Courses," both in graduate and undergraduate work.

Noxubee has vast recreational values for fishing, hunting, picnicking, bird watching, nature observing, etc. The present recreational day use of 60,000 to 65,000 is expected to increase greatly both during developmental progress and upon completion.

The areas of responsibility for members of the refuge staff will not change to any appreciable degree during the various phases of development nor upon completion of development.

The Refuge Manager in charge will be responsible for high level supervision to Assistant Refuge Managers and technicians in all phases of refuge management and development as well as for public relations and personnel matters involving delicate and controversial issues. Assistant Managers and technicians will assist the Manager in the preparation of refuge plans and reports by furnishing technical information and field data. They also will be responsible for supervising subordinate employees to a large degree and for directing and executing the timber, wildlife food production, recreational and other land use phases of refuge management.

The staffing patterns of permanent positions as listed in Exhibit 1-H are recommended during predevelopment, development and post development stages of the refuge.

## EXHIBIT 1-H

## REFUGE STAFF ORGANIZATION

Current Staff	Development	Post Development
Refuge Mgr., GS-11	Refuge Mgr., GS-12	Refuge Mgr., GS-12
Refuge Mgr., GS-7	Refuge Mgr., GS-9	Refuge Mgr., GS-9
Refuge Mgr., Trainee, GS-5	Refuge Mgr., Trainee, GS-5-7	Refuge Mgr., Trainee, GS-5-7
Forester, GS-11	Forester, GS-11	Forester, GS-11
Forester, GS-7	Forester, GS-9	Forester, GS-9
Forester, Trainee, GS-5	Forester, Trainee, GS-5-7	Forester, Trainee, GS-5-7
Wildlife Tech., GS-7	Wildlife Tech., GS-7	Wildlife Tech., GS-7
Adm. Assistant, GS-7	Adm. Assistant, GS-7	Adm. Assistant, GS-7
Mechanic (Auto), FT, WB	Mechanic (Auto), FT, WB	Mechanic (Auto), FT, WB
Maintenanceman, FT, WB	Maintenanceman, FT, WB	Maintenanceman, FT, WB
Maintenanceman, Int., WB	Maintenanceman, Int., WB	Maintenanceman, Int. WB
Laborer (3), Int., WB	Laborer (3), Farm, Int., WB	Laborer (3), Farm, Int. WB

In addition to the permanent staff, intermittent and seasonal employees to be paid from refuge allotment will be required in varying numbers. This number will depend upon the amount of development accomplished by force account and the intensity of land management.

#### 14. Photographs

The following unnumbered photographs are heterogeneous insofar as being pertinent to any particular section. However, they are of interest and of some significance to the over-all plan.



Photo-unnumbered (R--58, Exp. - Unnumbered)  
Bluff Lake



Photo-unnumbered (R 10-61, Exp. 11)  
Field managed for turkey under Cooperative Farming Agreement



Photo Unnumbered  
Pulpwood salvaged from tops of stumpage sold  
under management plan.



Photo-unnumbered (R 10-61, Exp. 31)  
 Extreme dust conditions at Recreation Area

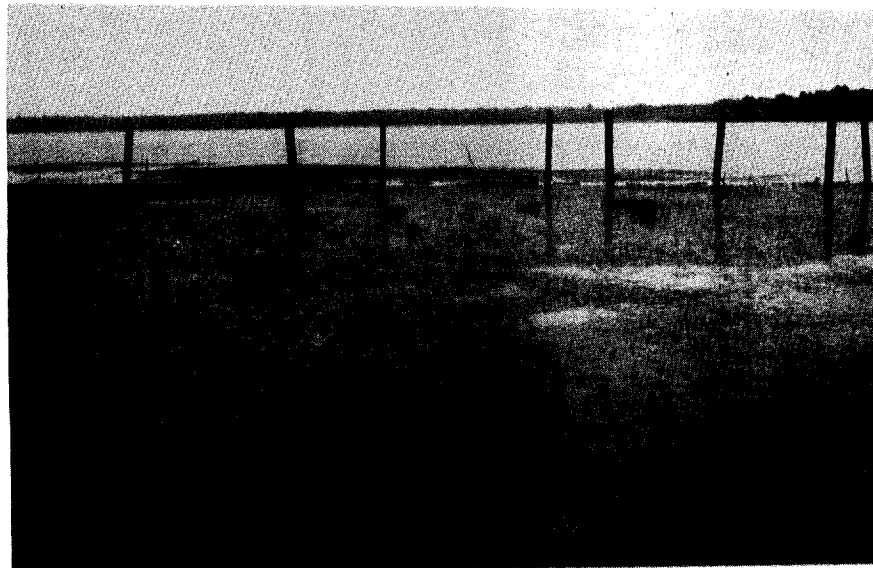


Photo-unnumbered (R 10-60, Exp. 19)  
 Bluff Lake near Spillway  
 Note Potamogeton Americanus in foreground.

## 2. Development

### 21. Land

#### 211. Topography.

This section is in reference to the Base Map (Exhibit 2-A). The refuge is drained mainly by Cypress, Oktoc, Jones, Loakfoma and Lynn Creeks and Noxubee River. Waters from Jones and Oktoc Creeks flow through Bluff Lake and such waters may be diverted into or excluded from Green Timber Reservoirs 1 and 2.

Excluding the Bevil Hill section, the refuge is relatively flat, particularly the creek bottoms, with the river and creek banks being generally higher than the adjacent lands. The banks have been built up by deposits of soil during periods of flooding. These conditions lend themselves to the construction and management of green timber reservoirs in places where water is available.

The relatively level and broad hardwood bottom lands on Noxubee consist of approximately 12,000 acres and, in addition to Green Timber Reservoirs 1 and 2 (740 acres), four green timber reservoirs are planned for construction on Oktoc, Jones, Dry and Loakfoma Creeks, having approximately 1,700 surface acres. The total of 2,440 acres of green timber reservoirs is 560 acres short of the goal of 3,000 acres set by Noxubee's management objectives. The topography of the hardwood bottom lands offers opportunity for feasible construction of additional green timber reservoirs not yet surveyed, and such will be included as a construction item.

The Bevil Hill section of the refuge consists of approximately 6,000 acres of steep sloped hill land with severe erosion having occurred prior to the establishment of the refuge. This area has re-established itself conservation-wise by natural regeneration of pine-hardwood or upland hardwood stands and through pine plantation plantings and check dams completed by Government agencies. Development is considered complete for the Bevil Hill section and proper land use is in effect.

The remaining lands of the refuge account for approximately 27,000 acres that are slightly rolling to relatively flat and generally forested by pine and pine-hardwood stands. The refuge's requirement of agricultural land and arable upland game plot is selected from the most suitable sites of this area normally adjacent to water developments. Other than for agriculture and upland game areas, this section of the refuge will require no development for proper land use or to meet wildlife demands.

212. Test Borings.

The drilling log (Exhibit 2-B) for the well located in the recreation area at Bluff Lake Spillway shows subsurface materials to a depth exceeding 800 feet. The present well located at headquarters and the two proposed wells in the recreational areas are believed to be of similar characteristics. Drilling logs for wells must be filed with the State Board of Water Commissioners. No other permits are required.

EXHIBIT 2-B

DRILLING LOG

Log of a well drilled by Mr. Harris of Shannon, Mississippi at a point approximately 9 miles from Brooksville, Mississippi or approximately 4 miles east of the well at headquarters, Noxubee Wildlife Refuge.

Soil and white rock	0	to	24 ft.
Blue Selma	24	to	40 ft.
Blue Selma showing little sand	40	to	75 ft.
Blue Selma	75	to	100 ft.
White Selma, very white	100	to	390 ft.
Dark Selma with gumbo beds	390	to	545 ft.
Flint rocks	545	to	550 ft.
Dark Selma and gumbo	550	to	643 ft.
Very tough gumbo	643	to	759 ft.
Eutaw Sand tight little water	759	to	813 ft.

Full sustained production not known. Produces enough for small pump, perhaps 5 to 6 gallons per minute.

UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF BIOLOGICAL SURVEY

## 213. Acquisition

213.1 Introduction. The Noxubee National Wildlife Refuge, located in east central Mississippi, was established by Executive Order 8444, June 14, 1940, as a refuge and breeding ground for migratory birds and other wildlife.

The Noxubee Refuge has undergone several boundary and acreage changes since its establishment. Within its presently approved boundaries (July 1, 1961), the refuge consists of 43,536.37 acres of Federal lands and 13,848 acres, including 20.01 acres currently leased, of privately owned land. The refuge boundary confines an additional 1,242 acres outside the approved boundary and this acreage is available for land exchange. Deleting the land available for transfer and including land approved for acquisition, the total area within the approved boundary is 57,384 acres (Exhibit 2-C Land Status Map).

Lands approved for acquisition include approximately 1,620 acres north of Highway 25. The principal justification for the purchase of these lands is for improvement of boundary lines for administrative purposes and for an increased acreage of refuge lands. Only small benefits would accrue to wildlife; and except for 163 acres of interior holdings, these lands (1,457 acres) are being deleted from our proposed acquisition boundary (Exhibit 2-C Land Status Map). The total area within the proposed acquisition boundary excluding the 1,242 acres of refuge lands outside the boundary, accounts for 55,927 acres.

The proposed land acquisition ( $13,848 - 1,457 = 12,391$ ) for Noxubee consists of numerous interior tracts and insets along the refuge's exterior boundary as well as a considerable acreage of potential waterfowl and wildlife habitat.

213.2 Justification for the Proposed Acquisition. Private ownership within a refuge is a troublesome thing. This especially is true of Noxubee where adverse holdings are small and often used for an owner residence and headquarters for free-roaming livestock. Livestock trespass laws are difficult, if not impossible, to enforce in the Noxubee Refuge community.

Additional agricultural lands are necessary to meet Canada goose habitat requirements as established by refuge objectives.

The lands of the proposed acquisition will satisfy the demand for additional waterfowl habitat and benefits will accrue to upland game. The additional lands will allow for proper management and development of the various creek watersheds and insure constant and complete utilization of the refuge.

213.3 Description of the Proposed Acquisition Lands. As a general description of the 12,391 acres involved, approximately 3,000 acres are arable land and 9,300 acres are woodlands fairly evenly divided between hardwood bottoms and pine and pine-hardwood uplands. Slightly less than 100 acres are involved in 15 or more farm ponds and small lakes. Of the 3,000 acres of arable land, approximately 500 acres are scattered in small fields through the various tracts and are suitable only for reforestation or upland game food plots. The remaining 2,500 acres are suitable for waterfowl habitat development and management. These 2,500 acres plus the approximately 1,500 acres of potentially available agricultural lands on present refuge lands total 4,000 acres capable of being farmed for the benefit of waterfowl, or 1,000 acres in excess of the 3,000 acre minimum set forth in the land management objectives. We, therefore, propose to delete unacquired lands in Sections 21, 22, 23, and 26, Township 17 North, Range 14 East (Exhibit 2-C), containing approximately 1,000 acres of agricultural land, from the active land acquisition program. These lands should remain inside the approved refuge boundary and be considered as second priority to land contained in Sections 25, 26, 35 and 36 T 17 N, R 14 E, and Sections 31, 32 and 33, T 17 N, R 15 E. Consideration of piecemeal acquisition of the second priority land should not be entertained.

Lands in Sections 25, 35 and 36, T 17 N, R 14 E, and 31, 32 and 33, T 17 N, R 15 E, (Exhibit 2-C), located immediately north of Bluff Lake and Green Timber Reservoirs 1 and 2, especially are important in relation to future Canada goose habitat development and management. These areas are divided about equally between a better than average type agricultural land and hardwood bottom land having four existing stock ponds ranging in sizes of from 1 to 2 acres and potentials for developing additional ponds and field dewatering impoundments. Water supply is from the Noxubee River and its watershed.

Proposed acquisition in Sections 1, 10, 11 and 12, T 16 N, R 15 E, (Exhibit 2-C) also will add materially to existing Canada goose habitat, particularly in the Loakfoma Lake area. This area consists of approximately one-third agricultural lands and two-thirds hardwood bottom lands. Water supply is from both Oktoc and Loakfoma Creeks as the confluence of these streams is located adjacent Section 10.

Adverse holdings along streams where development and intensive management is planned must be acquired. Acquisition is important particularly on Noxubee River and Oktoc, Cypress and Dry Creeks since privately owned lands in these areas will interfere either directly or indirectly with green timber reservoir development or management (Photo No. 2). Other interior holdings interfere with upland game management and protection and should be acquired as rapidly as possible (Photos 3, 4, 5).

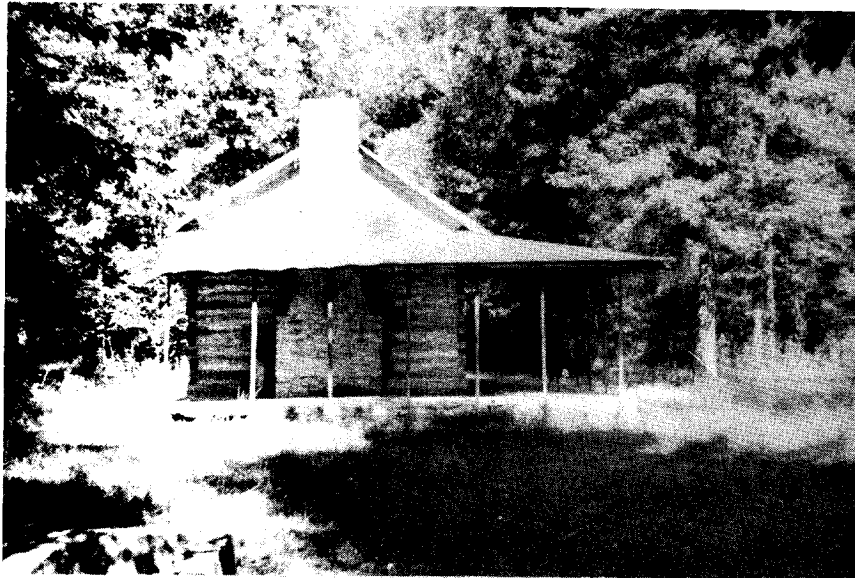


Photo 2 (R 15-60, Exp. 16)  
Beattie Camp, 250 yds. from Bluff Lake

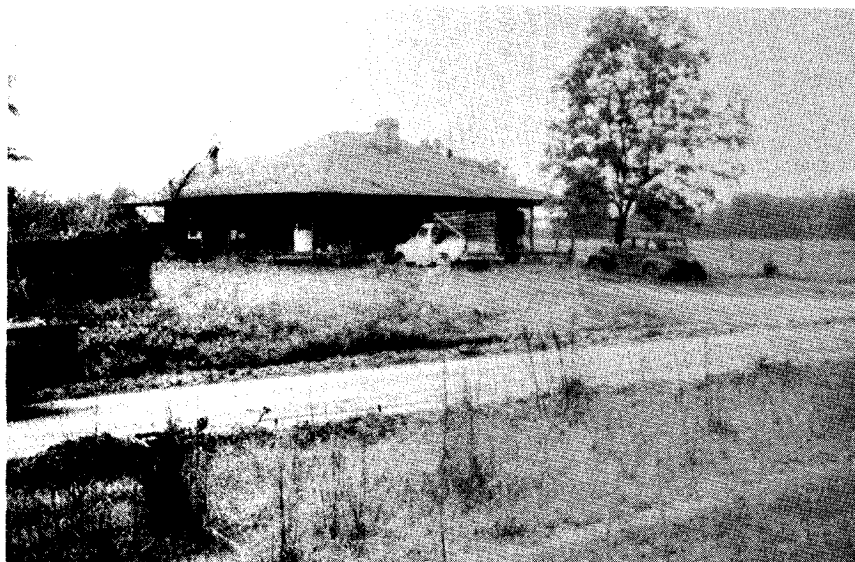


Photo 3 (R 16-60, Exp. 1)  
Adverse Holding, Loakfoma Area



Photo 4 (R 14-61, Exp. 10)  
Hog Lot, Source of Noxubee's feral hogs



Photo 5 (R 16-60, Exp. 5)  
Typical camp ground on bank of Noxubee River

Proposed acquisition includes Section 16, T 16 N, R 14 E, and a portion of Section 16, T 16 N, R 15 E. These are "school" sections and will be difficult to purchase. However, there is a possibility that these lands may be acquired by land exchange. Sections 26, 35 and 36, T 17 N, R 13 E, and Sections 4, 5, 6, 8 and 9, T 16 N, R 14 E, involve four ownerships. However, the majority of this land belongs to the Mississippi State University and commonly is referred to as the University's Experimental Forest Land. The State lands will be difficult to purchase outright, but it may be possible to acquire them through land exchange. Refuge lands north of Sections 23 and 24, T 17 N, R 13 E, or refuge lands in the Bevil Hill section should be made available for exchange for the University lands. Although most of the State land is suitable for bottom land timber, it has been planted largely to slash pine and thus is an "experimental" forest. After acquisition, this area could become an outstanding waterfowl area in connection with Jones Creek Impoundment Unit.

213.4 Development and Management. Those parts of Sections 25, 35, 36 T 17 N, R 14 E; 31, 32, 33 T 17 N, R 15 E, and 1, 10, 11, 12 T 16 N, R 15 E, proposed for acquisition, will be developed and managed primarily to benefit Canada geese. The State lands, Sections 26, 35, 36 T 17 N, R 13 E, and Sections 4, 5, 6, 8, 9 T 16 N, R 14 E, when acquired, will be developed and managed for Canada geese by placing pine plantings under a short rotation, clear cutting and renovating the land to crop production at end of forestry rotation.

Land proposed for acquisition located on Oktoc, Dry and Cypress Creeks, namely, Sections 24, 25, 26 T 17 N, R 13 E, and Sections 19, 20 and 32 T 17 N, R 14 E, includes both bottom lands and uplands. The bottom lands (Sections 24, 25, 32) will be involved in the development and management of green timber reservoirs.

Other tracts, which include numerous interior holdings and insets along the boundary, will be managed primarily for indigenous species, principally turkey and deer.

In general, development will include reforestation, land renovation for agricultural purposes and possibly construction of green timber reservoirs in the distant future. Management will be directed to benefit waterfowl on the agricultural and hardwood bottom lands and timber production and improvement of upland game and deer habitat on the upland pine and pine-hardwood lands.

213.5 Evaluation. A concerted effort should be made to acquire the lands outlined in this section of the Noxubee Plan through land exchange, timber land exchange, and purchase with "Duck Stamp" funds.

Land appraisals are incomplete on the areas of acquisition. However, based on current (1961) land values, the approximate cost would be \$75.00 per acre. By excluding the 1,350 acres of second priority lands valued at \$100.00 per acre, the total future acquisition is estimated to be \$792,000.00.

The Regional Office Land Acquisition Review Committee has given approval to the aforementioned changes in Noxubee approved acquisition boundaries, and the committee recommends that all Noxubee acquisition be approved by MBCC for purchase with Duck Stamp funds. Approval by the MBCC would expedite the acquisition programs but should in no way impede acquisition by land exchange or by timber land exchange.

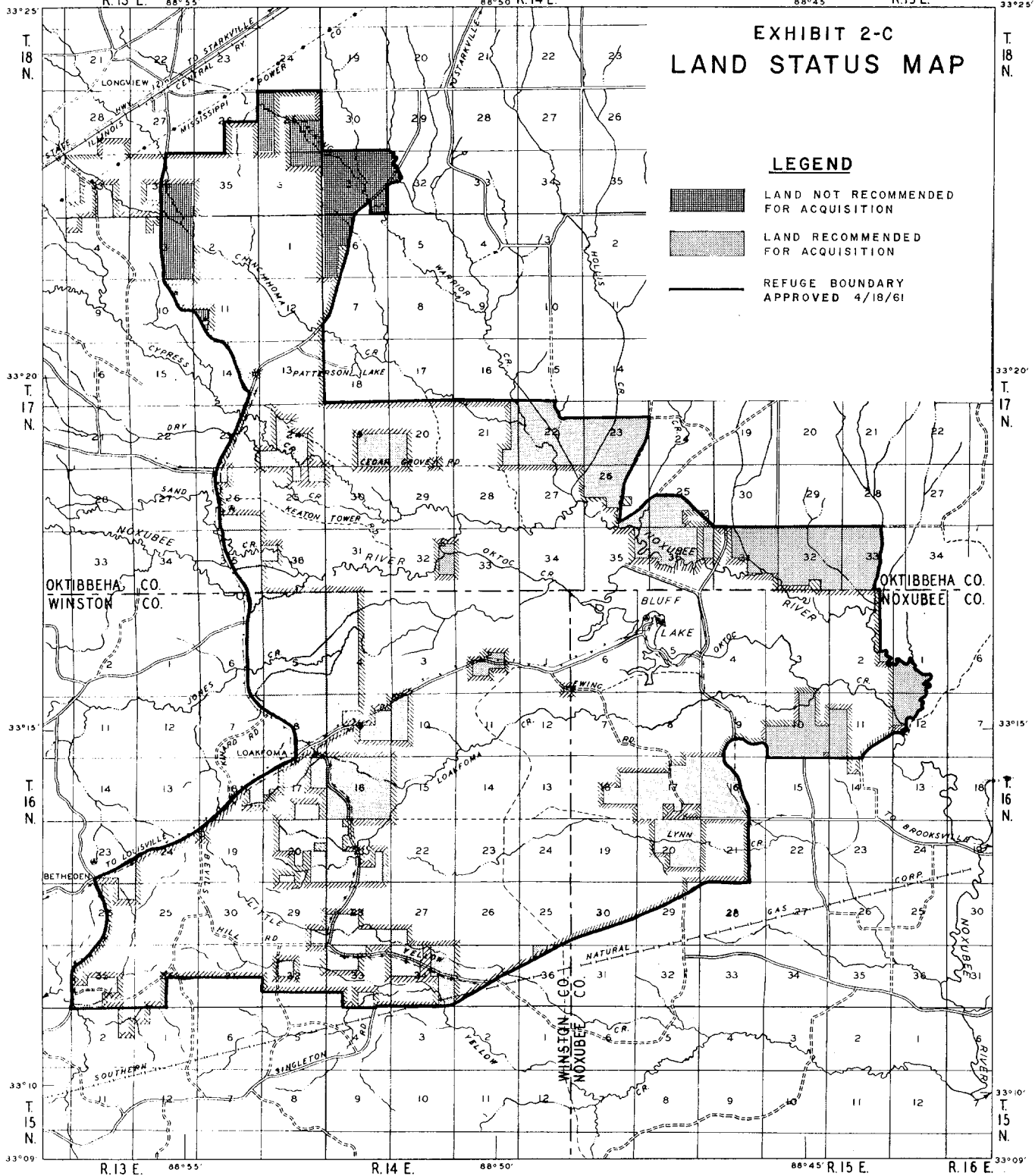
The ownership pattern at Noxubee changes rapidly. Since the initial preparation of this Master Plan in 1961, a number of options to purchase or exchange lands have been signed by private landowners and titles to additional lands have been vested in the government. These changes as of July 1, 1963 are reflected in Exhibit 2-C (Land Status Map).

# NOXUBEE NATIONAL WILDLIFE REFUGE

DEPARTMENT OF THE INTERIOR

NOXUBEE, OKTIBBEHA AND WINSTON COUNTIES, MISSISSIPPI

FISH AND WILDLIFE SERVICE



## 22. Water

### 221. Adequacy of Water Supply

221.1 Watershed Acreage and Stream Flow. Requirements for all purposes of the refuge presently are supplied by surface drainage water from the numerous creeks on the refuge. Jones Creek has a watershed of 9,000 acres. Oktoc Creek has a watershed of 15,000 acres not including waters from Noxubee River which flow into Oktoc Creek in Section 32, T 17 N, R 14 E. Loakfoma Creek has a watershed of 7,700 acres above the proposed permanent impoundment and 3,800 acres above the proposed green timber reservoir. Dry Creek has a watershed of 3,000 acres above the proposed green timber reservoir. Allowing for a run-off of 25% and a rainfall of 2.77 inches in October, each green timber reservoir could be filled in one month except the Jones Creek Reservoir which would take two months. With water available from the proposed storage reservoir, it also could be filled in one month. (Exhibit 2-D Flow Data and Water Temperatures).

For domestic use, potable water is found at about 800 feet. One well is recommended for each of the two recreation areas.

221.2 Water Quality. Three analyses have been made by Geological Survey of water obtained at the Brooksville Gauging Station. These analyses are made a part of this report as an indication of water quality of the Noxubee River and its tributaries (Exhibit 2-E, Water Analysis Noxubee River and Refuge Well).

222. Water Rights.

House Bill 232 of the State of Mississippi Legislative session of 1956, as amended, authorizes a Water Resources Commission which issues water use permits for the use of all surface waters except for those streams having a minimum average flow of one-half million gallons a day in which no more than 300 acre feet of impounded water are used. It is advisable to have permits for all impoundments regardless of size. In addition to the above mentioned water use permits, permits must be obtained from the State Board of Health for all impounded waters. Without benefit of counsel, the Branch of Engineering believes that no problem will be involved in obtaining permits for all the green timber reservoirs since they would be used only from October to March of each year. The two permanent impoundments should not present a problem since, after initial filling, stream flow would not be affected significantly. To satisfy the Water Resources Commission, initial filling of the two permanent impoundments probably would have to be accomplished during spring flood season.

## EXHIBIT 2-D

STREAM FLOW DATA AND WATER TEMPERATURES

Noxubee River near Brooksville, Mississippi

Station Number 92-4475.00

HIGHEST MEAN DISCHARGE FOR FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR ENDING SEPTEMBER 30

YEAR	1	3	7	15	30	60	90	120	150	183	274
1941	3230.0	2840.0	2330.0	1420.0	1250.0	853.0	738.0	762.0	670.0	573.0	442.0
1942	1920.0	1870.0	1720.0	1530.0	1320.0	957.0	721.0	651.0	561.0	478.0	335.0
1944	16200.0	13400.0	8250.0	5170.0	3210.0	2420.0	2080.0	1610.0	1310.0	1080.0	750.0
1945	13000.0	10800.0	6850.0	4810.0	3250.0	2420.0	1770.0	1420.0	1190.0	989.0	676.0
1946	16200.0	12900.0	8430.0	5190.0	3330.0	2610.0	2250.0	1740.0	1540.0	1330.0	1050.0
1947	8100.0	7060.0	5040.0	3440.0	3220.0	1880.0	1620.0	1580.0	1330.0	1240.0	886.0
1948	8100.0	7710.0	7230.0	4750.0	3670.0	2430.0	2160.0	1680.0	1410.0	1180.0	807.0
1949	38000.0	30300.0	16000.0	8080.0	5820.0	4290.0	3570.0	2960.0	2630.0	2360.0	1630.0
1950	21900.0	16700.0	9970.0	5410.0	3110.0	3000.0	2530.0	1990.0	1640.0	1370.0	1070.0
1951	45400.0	25700.0	13700.0	7390.0	4310.0	3440.0	2860.0	2480.0	2100.0	1780.0	1270.0
1952	2250.0	2100.0	1870.0	1340.0	968.0	819.0	728.0	631.0	548.0	462.0	320.0
1953	6560.0	5730.0	4830.0	3520.0	2230.0	1220.0	1300.0	1150.0	1000.0	830.0	572.0
1954	3000.0	2770.0	2260.0	1380.0	1290.0	844.0	649.0	625.0	517.0	432.0	297.0
1955	5900.0	5700.0	4040.0	2540.0	1890.0	1340.0	1040.0	871.0	738.0	621.0	440.0
1956	6320.0	5860.0	4400.0	2460.0	2130.0	1700.0	1450.0	1140.0	923.0	761.0	517.0
1957	6220.0	5620.0	4210.0	2810.0	1750.0	1420.0	1290.0	1240.0	1050.0	885.0	651.0

EXHIBIT 2-D (Continued)

LOW FLOW INFORMATION ON NOXUBEE RIVER  
ABOVE NOXUBEE WILDLIFE REFUGE

Noxubee River near Loakfoma, Mississippi

Location: NE $\frac{1}{4}$  Section 16, T 16 N, R 14 E  
CHOCTAW MERIDIAN at bridge on  
State Highway 25, 2 $\frac{1}{2}$  miles  
north of Loakfoma

Drainage Area: About 130 sq. miles

<u>Date</u>	<u>Discharge in cfs</u>
9-26-44	8.7
9-24-53	8
10-14-55	7.6
10-28-58	12.8
6-8-60	18.5

Noxubee River near Webster, Mississippi

Location: NW $\frac{1}{4}$  Section 19, T 16 N, R 13 E,  
CHOCTAW MERIDIAN at bridge on  
County Road 2 miles NW Webster

<u>Date</u>	<u>Discharge in cfs</u>
11-2-44	9.1
7-4-45	10.5
7-28-45	74
10-14-55	2.1
6-8-60	18.8

## EXHIBIT 2-D (Continued)

NOXUBEE RIVER NEAR BROOKSVILLE, MISS.

LOWEST MEAN DISCHARGE FOR FOLLOWING NUMBER OF CONSECUTIVE DAYS

STATION NUMBER	YEAR	7	15	30	60	120	183
2 02447500	1941	14.9	16.5	21.9	34.1	60.7	115.3
2 02447500	1944	4.6	4.9	6.5	8.3	24.7	50.6
2 02447500	1945	7.2	10.3	11.1	14.4	21.9	32.8
2 02447500	1946	18.1	20.1	22.9	32.4	120.6	328.2
2 02447500	1947	8.6	9.7	10.1	11.9	29.0	65.4
2 02447500	1948	6.7	10.6	11.7	20.9	70.0	59.4
2 02447500	1949	26.6	36.5	42.9	66.6	78.9	104.3
2 02447500	1950	31.9	41.9	50.6	75.2	181.4	340.9
2 02447500	1951	11.0	12.6	17.2	20.6	28.0	55.9
2 02447500	1952	.1	.2	.3	1.6	5.6	11.5
2 02447500	1953	.0	.0	.0	.6	10.2	29.1
2 02447500	1954	.0	.0	.0	.4	2.7	11.0
2 02447500	1955	.2	.2	.6	1.2	13.7	23.3
2 02447500	1956	.2	.4	2.5	3.9	12.4	22.9
2 02447500	1957	1.2	1.8	4.0	12.1	32.6	116.9

EXHIBIT 2-D (Continued)

WATER TEMPERATURE DATA - NOXUBEE RIVER  
BROOKSVILLE, MISSISSIPPI

DATE	TEMPERATURE °F	DATE	TEMPERATURE °F
2-3-44	50°	10-28-58	56°
11-2-44	58	1-19-59	40
12-12-45	40	5-19-59	72
7-10-46	77	10-14-59	67
11-21-57	55	3-10-60	47
3-24-58	52	8-18-60	75
6-17-58	77	12-15-60	39
10-14-58	63		

## EXHIBIT 2-D (Continued)

NOXUBEE RIVER NEAR BROOKSVILLE, MISS.

STATION NUMBER 02447500

CLASS LIMIT	.0	.1	.2	.4	.9	1.8	3.7	16.0	68.0	000280.0	1200.0	5200.0	22000.0	

## EXHIBIT 2-E

## WATER ANALYSIS

Location: Bluff Lake, Miss., Noxubee County - SE $\frac{1}{4}$  sec 5 T 16 N, R 15 E

Source: Drilled well - Depth: 870'; diam. 4" O 2". Cased to 870'.  
 Collected at pressure tank. Owner: U.S. Fish and Wildlife Service,  
 Noxubee Co. Nat'l Wildlife Refuge, Macon, Miss. WBF: Eutaw; yield  
 5 gm Collector E.H. Boswell  
 pump est.  
 Turbid. Well recently cleaned out.

Date of Collection: Nov. 30, 1955

Analysed by: H.G. Jeffery

Lb. No. 20908

## Parts per million

Silica (SiO <sub>2</sub> ) - - - - -	---
Iron (Fe) - - - - - <u>1</u> /	.04
Calcium (Ca) - - - - -	8.6
Magnesium (Mg) - - - - -	2.4
Sodium (na) - - - - -	404
Potassium (K) - - - - -	7.1
Bicarbonate (CO <sub>3</sub> ) - - - - -	29)
(HCO <sub>3</sub> ) - - - - -	507)565
Sulfate (SO <sub>4</sub> ) - - - - -	1.4
Chloride (Cl) - - - - -	300
Fluoride (F) - - - - -	5.0
Nitrate (NO <sub>3</sub> ) - - - - -	5.1
Dissolved Solids - - - - -	1,060
Total hardness as CaCO <sub>3</sub> - - - - -	32

## Remarks:

Temperature ( °F)

pH - - - - - 8.7

1/ Fe: Total --- .34  
 Sol. --- .04  
 ppt. --- .30

U.S. GEOLOGICAL SURVEY  
 WATER RESOURCES DIVISION  
 JACKSON, MISSISSIPPI

## EXHIBIT 2-E (Continued)

## NOXUBEE RIVER AT MACON, NOXUBEE COUNTY, MISS.

Laboratory number.....	24910	26048	26784
Date of collection .....	10-20-58	3-2-59	6-25-59
Time.....	1:00 pm	3:40 pm	11:05 am
<u>PARTS PER MILLION</u>			
Silica (SiO <sub>2</sub> ).....	3.2	2.0	2.6
Iron (Fe) in solution when analyzed	.32	.52	.20
Manganese (Mn).....	--	--	--
Calcium (Ca).....	7.6	13	11
Magnesium (Mg).....	1.6	2.6	2.2
Sodium (Na).....	3.1	5.0	4.0
Potassium (K).....	1.6	1.3	1.3
Bicarbonate (HCO <sub>3</sub> ).....	34	39	40
Carbonate (CO <sub>3</sub> ).....	0	0	0
Sulfate (SO <sub>4</sub> ).....	3.2	15	7.6
Chloride (Cl).....	3.5	5.2	4.0
Fluoride (F).....	.1	.2	.1
Nitrate (NO <sub>3</sub> ).....	.9	.8	1.5
Dissolved solids			
Calculated .....	42	65	54
Residue on evaporation at 180°C.....	45	84	70
Hardness as CaCO <sub>3</sub> .....	27	43	36
Noncarbonate hardness as CaCO <sub>3</sub>	0	11	4
Alkalinity as CaCO <sub>3</sub> .....	--	--	--
Specific conductance (micromhos at 25°C).....	76	111	103
pH.....	7.0	7.0	6.8
Color .....	5	22	40
Water temperature (°F).....	65	52	80
Air temperature (°F).....	--	--	--
Gage height.....	6.88	8.18	6.95
Discharge (cfs)	75	336	105
Appearance.....	sl. muddy	sl. mud.	f. clear
Collected at .....	d.s. bridge gage	d.s.b.	700' below gage
Collector .....	B.J.M	B.J.M.	B.J.M.
Depth .....		10.2 ft.	2.45

U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

## 23. Impoundment Facilities (Existing and Proposed)

### 231. Present Impoundments

231.1 Bluff Lake. Bluff Lake is the largest, acre-wise, of the existing or proposed water developments. The lake contains 1,200 surface acres of water at spillway elevation 221.5' M.S.L. with a 4' average water depth and is the nucleus of the refuge's water-fowl habitat. For each one foot draw-down, the water surface decreases from 150 to 200 acres, approximately (Exhibit 2-G Summary of Existing and Proposed Impoundments).

The Bluff Lake water supply is from the Oktoc and Jones Creek watersheds. The levee crosses Oktoc Creek and is 10,500 feet in length, of which 5,400 feet (east levee) are a county-maintained road. However, the county does not maintain the sides of the levee.

The east and part of the north levee, as well as the banks along the south shore (Photo 6), have eroded on the lake side by wave action. In addition, surface run-off has eroded the downstream side of the levee.

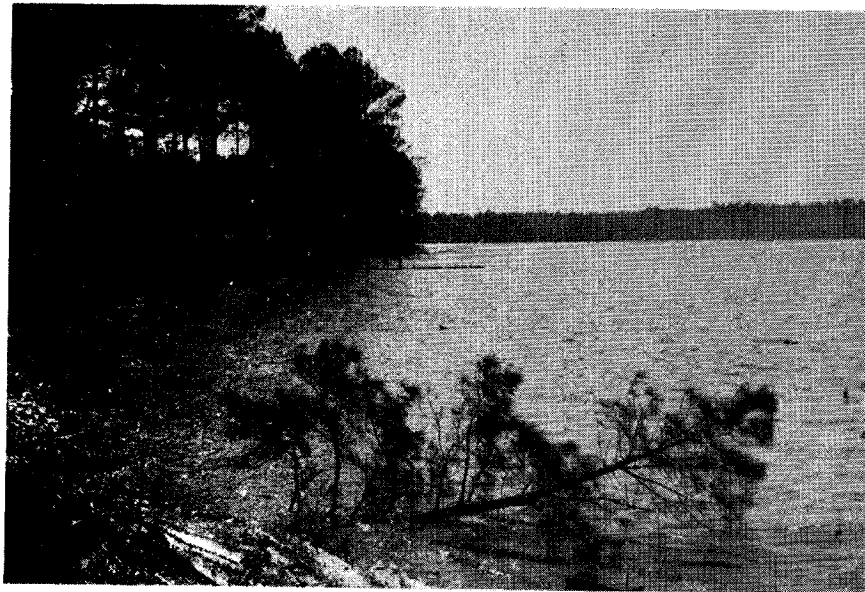


Photo 6 (R 4-60, Exp. 18)  
Erosion on south shore of Bluff Lake

Construction recommendations for the Bluff Lake Levee are to rebuild Slopes 3:1 on the lake side and 4:1 on the downstream side (Exhibit 2-F, Typical Cross-Section - Roads and Dikes), riprap lake side to height 5 feet vertically above spillway crest elevation 221.5 and 2 feet vertically below crest elevation, clear and grub as necessary in rebuilding slopes and sod banks with perennial grasses and legumes.

A slope of 4:1 is recommended on the downstream side to allow for mowing and maintenance operations on the high slopes.

231.2 Green Timber Reservoir Nos. 1 and 2. Green Timber Reservoir No. 1 was constructed and activated in 1955. It is located in Sections 3 and 4, T 16 N, R 15 E, and is bounded on the north by the Noxubee River and on the south by Oktoc Creek, lying immediately below Bluff Lake. The levee is 7,920 feet in length and impounds 400 surface acres of water at designed full pool elevation.

Green Timber Reservoir No. 2, constructed in 1958, lies immediately below Green Timber Reservoir No. 1 between Noxubee River and Oktoc Creek. The levee is 5,700 feet in length and, at designed full pool elevation, impounds 340 surface acres of water.

These two reservoirs were formed by construction of dikes between the banks of the Noxubee River and Oktoc Creek and are fed by Bluff Lake through control structures in the Bluff Lake levee. During normal operation, when Noxubee River is below flood stage, excess water entering these reservoirs is allowed to spill out through natural spillways formed by depressions in the terrain along the Oktoc and Noxubee. During flood stage, flood water from the Noxubee River runs into Green Timber Reservoir No. 1 and crests its dike and hence into Green Timber Reservoir No. 2, also cresting its dike.

The topping of Green Timber Reservoir levees 1 and 2 by flood water is causing considerable damage (Photo 7) and expensive maintenance. To alleviate this situation, a spillway on each of the dikes is proposed. The spillways, as planned, would be built by lowering each dike by 18" (free board) for a distance of 600 feet and riprapping the cut. The spillways will allow flood waters to pass through each green timber reservoir without washing the full length of each dike and restrict erosion to the spillway area which would be more easily repaired.



Photo 7 (R 8-59, Exp. 19)  
Erosion Green Timber Reservoir No. 2 levee



Photo Unnumbered (R 11-61, Exp. 30)  
Ground Cover Green Timber Reservoir No. 1

231.3 Jones Creek Field Impoundment. This dewatering type impoundment was constructed in 1954, has a levee length of 3,600 feet and, with water at spillway level, floods 52 acres of agricultural land. Its water supply is from rainfall run-off of the upper portion of the Jones Creek Watershed. An added water supply will be from the storage reservoir on Ross Branch upon its completion.

231.4 Cypress Creek Field Impoundment. This impoundment is of a dewatering type and floods 28 acres of agricultural land when water is at a spillway level. The dike is 3,000 feet in length. Water supply is from rainfall run-off of Cypress Creek Watershed.

231.5 Morgan Field Impoundments, West of Road. These dewatering type impoundments have levee lengths of 950 feet and 350 feet and flood a combined acreage of 28 acres of agricultural land. Water supply is from rainfall run-off within the small field watersheds. Both impoundments will lose their usefulness with the construction of the Loakfoma Lake insofar as the need for crop flooding is concerned.

231.6 Smith Field Impoundment No. 1. This impoundment is of a dewatering type with a levee length of 600 feet and floods 10 acres of agricultural land at spillway level in addition to approximately 15 acres of small mast-producing hardwoods. Water supply is from rainfall run-off of a relatively small watershed.

231.7 Smith Field Impoundment No. 2. Impoundment No. 2 has a levee length of 500 feet, floods 20 acres of agricultural land, and is of a dewatering type. Water supply is from run-off on a relatively small field watershed.

231.8 Ponds. Scattered throughout the refuge area, fifteen relatively permanent-type small ponds exist, having a total of approximately 2,000 feet of levees.

231.9 Water Holes. Noxubee has constructed a total of 78 water holes for the benefit of deer and turkey and other forest game species. They are approximately 10 feet wide and 100 feet long, having an average depth of about 5 feet.

231.10 Morgan Field Impoundment, East of Road. This dewatering-type impoundment has a levee length of 150 feet and impounds 8 acres of agricultural land at spillway elevation. Water supply is from a relatively small field watershed. However, on completion of Loakfoma Lake, water from this impoundment may be diverted into the dewatering area.

## EXHIBIT 2-G

SUMMARY OF EXISTING AND PROPOSED IMPOUNDMENTS

GREEN TIMBER RESERVOIR	MAXIMUM AREA ACRES	AREA WITH 1 FT. DRAW- DOWN-ACRES	AREA WITH 2 FT. DRAW- DOWN-ACRES	3' ACRES	4' ACRES	AVERAGE DEPTH FEET	ACRE-FT. MAXIMUM	COST PER MAXIMUM SURFACE ACRE	LENGTH OF LEEVE FEET
(Exist)									
GTR No. 1	400						600		7920
(Exist)									
GTR No. 2	340						800		5700
(Proposed)									
GTR No. 3	560	460	360			1.3	728	\$108.50	6600
(Proposed)									
GTR No. 4	700	600	440	330		2.5	1760	59.80	4335
(Proposed)									
GTR No. 5	220					2.0	440	144.50	3960
(Proposed)									
GTR No. 6	215	160	110	50		3.0	640	232.00	4560
(Proposed)									
GTR (Not Surveyed)	560								4000 Est.
PERMANENT IMPOUNDMENT									
Loakfoma	615	510	400	275	140	2.5	1800	52.00	4480
Small Impound.									
Rose Branch	70					5.7	400	87.50	580
(Exist)									
Bluff Lake	1200					4.0	5000		10500
Small Perm.									
Ponds (15)	25								1991
Water Holes(78)	10'x100'ea.								--
Water Holes									
Proposed (25)	10'x100'ea.								--

EXHIBIT 2-G (Continued)

SUMMARY OF EXISTING AND PROPOSED IMPOUNDMENTS

DEWATERING IMPOUNDMENTS (Existing)	MAXIMUM AREA ACRES	LENGTH OF LEVEE FEET
Jones Creek	52	3600
Smith Field 1	13	600
Smith Field 2	20	500
Cypress Creek	28	3000
West Morgan Field	20	1300
East Morgan Field	8	150

232. Proposed Impoundment

232.1 Loakfoma Lake (Bid Invitation SFW 4-75). Loakfoma Lake is planned as an open-water permanent impoundment to serve as a waterfowl feeding and resting area, and it constitutes an important place in the refuge's waterfowl habitat expansion program, particularly for Canada geese. Incidental benefits will include fishing and other recreational activities.

The lake site is located in Sections 5, 8 and 9, T 16 N, R 15 E, with the levee immediately west of the Bluff Lake to Brooksville county road (Photo 8). The Loakfoma levee, (Exhibit 2-F, Typical Cross Section - Roads and Dikes) as planned, crosses Loakfoma Creek and impounds 615 surface acres of water or 1,550 acre feet at spillway elevation, 226' M.S.L. The dike will be 4,480 feet in length with a top elevation of 229' M.S.L.

A simple stoplog structure 49' wide (see 4R Miss-328-16.0) will be required as a spillway and drainage structure. The construction of this impoundment will also involve clearing of 500 acres of timberland.



Photo 8 (R 14-61, Exp. 17)  
Site of proposed Loakfoma Lake Levee along Bluff Lake Road. Levee will closely follow fence row on right of picture.

232.2 Storage Reservoir (Ross Branch). This reservoir is for the purpose of storing water as a supply for flooding the Jones Creek Field Impoundment and, to a lesser extent, Green Timber Reservoir No. 4. Rainfall run-off normally is inadequate to flood the above impoundment during the early waterfowl season. Flooding of the Jones Creek Field Impoundment is necessary to obtain waterfowl utilization of the 330 acres of farm crops grown on the Presock Unit (Compartment 19).

The reservoir, as planned, is located in Section 4, T 16 N, R 14 E, and contains approximately 70 surface acres or 400 acre feet of storage water at spillway elevation 255' M.S.L. The levee will be 580 feet in length at elevation 260' M.S.L.--that being the top height. The levee crosses an intermittent stream which flows into Jones Creek (Photo 9). The watershed above the reservoir is approximately 1,100 acres. A riprapped spillway 40 feet in width, placed in cut, is planned for overflow. Release of water for irrigation will be through a 16" diameter cast iron pipe with gate valve.



Photo 9 (R 14-61, Exp. 13)

Site of Ross Branch storage reservoir for Jones Creek Impoundment. Intermittent stream is low part of picture and emerges from woods at large oak in center of picture.

232.3 Green Timber Reservoir No. 3 (Bid Invitation SFW 4-18).  
Green Timber Reservoir No. 3, as planned, is located in Sections 34 and 35, T 17 N, R 14 E, and is bound on the north by Noxubee River and on the south by Oktoc Creek. The dike length is 6,500 feet, impounding 560 surface acres at spillway elevation.

An abandoned road bed (Photo 10), will be utilized in part for dike fill. Due to the deteriorated condition of the old road bed, it will not be utilized as a main part of the dike. Water control will be furnished by 2-36" corrugated metal pipes and flashboard, riser with 80 feet of concrete paved spillway at elevation 227' M.S.L. and 425 feet of emergency spillway at elevation 227.5' M.S.L. Design pool elevation is 226.5' to be maintained by stoplogs, with the paved structure acting as a secondary overflow going into effect at elevation 227.0' and the emergency spillway going into effect at elevation 227.5' M.S.L.

Due to the excellent timber stand of small mast-producing oak and other desirable mast-producing species and complete water control possibilities, Green Timber Reservoir No. 3 will add greatly to the improvement of waterfowl habitat on Noxubee.



Photo 10 (R 14-61, Exp. 14)  
Abandoned road to be used as part of levee in construction of Oktoc  
Green Tree Reservoir #III.

232.4 Green Timber Reservoir No. 4 (OP. CIT.). Green Timber Reservoir No. 4, as planned, is located in Sections 33 and 34, T 17 N, R 14 E, and Sections 1 and 2, T 16 N, R 14 E. This reservoir will have a levee 4,335 feet in length with cross section as shown in Exhibit 2-F. The top elevation of the levee will be 234' M.S.L. Design pool surface will be 231.5' M.S.L. maintained by two 36" corrugated metal pipes with flashboard risers. There will also be a concrete spillway 80 feet in length with invert elevation 232.0' and 400 feet of emergency spillway in cut with floor elevation of 232.5'. Seven hundred acres or approximately 300 acre feet of water will be impounded at elevation 231.5' M.S.L.

The construction of this reservoir will be the least expensive on a per acre basis of the proposed green timber reservoirs. With the completion of Green Timber Reservoir Nos. 3 and 4, in addition to enhancing utilization by waterfowl of the hardwood bottom lands, sufficient desirable habitat will exist on Noxubee both for a sanctuary and a limited waterfowl hunting area.

232.5 Green Timber Reservoir No. 5. Green Timber Reservoir No. 5 lies in Section 25, T 17 N, R 13 E and will require a levee 3,960 feet long with a top elevation approximately 5' above natural ground at dike site to impound 220 surface acres of water. Three parcels of land will have to be acquired prior to construction of this reservoir since it is located in the main on interior tracts not presently owned by the Government. Water supply will be furnished by Dry Creek, an intermittent stream having a watershed of 3,000 acres. Water control will be by corrugated metal pipe and flashboard riser with riprapped emergency spillway.

232.6 Green Timber Reservoir No. 6. Green Timber Reservoir No. 6, as planned, is located in Sections 11 and 14, T 16 N, R 14 E. Construction will include 4,560' levee (Exhibit 2-F), having a top elevation of 253' M.S.L. with a spillway crest of 251' M.S.L. The reservoir will contain 215 surface acres of water at spillway elevation. Water will be furnished by Loakfoma Creek which has a watershed of approximately 3,800 acres above the impoundment. Water control will be by corrugated metal pipe and flashboard riser with riprapped emergency spillway.

232.7 Green Timber Reservoirs, Sites Undetermined. Additional engineering surveys are required to depict other green timber reservoir sites in the amount of 560 acres necessary for the refuge's objective of 3,000 acres. Any attempt to dam Oktoc Creek above elevation 227' (Green Timber Reservoir No. 3) would cause the creek to flow back into the Noxubee River unless the river also were dammed. Pumps could be placed in Oktoc Creek and water pumped into other reservoirs above Green Timber Reservoir No. 3, but due

to the relative inaccessibility of this area and the maintenance requirements of the pumps, this method does not seem advisable until other sites have been surveyed.

From observation, numerous small areas on the refuge indicate green timber reservoir potential. Attempts will be made to locate additional suitable green timber reservoir sites as development progresses.

233. Summary of Impoundment Facilities.

Topography and location, dike designs, and concise information of existing and proposed impoundments are presented in Exhibits 2-A, 2-F, and 2-G.

A summary of recommended construction for these facilities is as follows:

Bluff Lake Levee Repair. Establishment of grade, grubbing, riprapping, sodding or seeding.

Green Timber Reservoir No. 1 Spillway. Construction, riprapping.

Green Timber Reservoir No. 2 Spillway. Construction, riprapping.

Loakfoma Lake. Levee 4,480 feet, spillway, and lake bed clearing.

Storage Reservoir. Levee 570 feet, 1-16" pipe and gate, concrete spillway.

Green Timber Reservoir No. 3. Levee 6,600 feet, 2-36" CM pipe and flashboard risers, concrete spillway.

Green Timber Reservoir No. 4. Levee 4,335 feet, 2-36" CM pipe and flashboard risers, concrete spillway.

Green Timber Reservoir No. 5. Levee 3,960 feet, 1-36" CM pipe and flashboard riser, riprapping of spillway.

Green Timber Reservoir No. 6. Levee 4,560 feet, 2-36" CM pipe and flashboard riser, riprapping of spillway.

Green Timber Reservoirs, Sites Undetermined. Size 560 acres.

Estimated cost and development phase for each major item are listed in Section 4, Budgetary (Recapitulation of Cost, Exhibit 4-A).

## 24. Buildings

### 241. Existing Facilities and Proposed Development (Exhibit 2-H, Headquarters and Recreational Area No. 1)

241.1 Existing Buildings. Existing buildings on Noxubee are as follows:

Quarters No. 1, Adequate.

Quarters No. 2, Scheduled for replacement.

Quarters No. 3, Scheduled for replacement.

Quarters No. 4, Adequate.

Quarters No. 5, Adequate.

Shop and Equipment Storage Building, Closed type, shop scheduled for deletion.

Equipment Sheds, (2), 114' x 30' each, adequate.

Paint and Oil Building, scheduled for replacement.

Grain and Fertilizer Building, Adequate.

Office and Storage Building, Retain as storage building.

Lumber Storage Building, Adequate.

241.2 Proposed Construction (Bid Invitation SFW 4-68). Buildings recommended will, so far as possible, be standard types with brick veneer over block construction. Proposed construction includes:

Residences (2), 28 - 0 x 66' - 8", with carport, (4R-Miss-328-22.0), Replacement of Quarters Nos. 2 and 3 which are sub-standard. (Photos 11 and 11a).

Shop (1), Automotive and heavy equipment repair, (65' - 4" x 30' - 8", 4R-Miss-328-21.0).

Building (1), Paint and oil storage, (30' x 20', 4R-Miss-328-14.0).

Building (1), Dynamite storage.

Office, Construction 60' - 8" x 28' - 8" (4R-Miss-328-13.0).

Play Area Fence for residence children.

Estimated cost for each major development item is listed in Section 4, Budgetary (Recapitulation of Cost, Exhibit 4-A).

241.3 Summary of Buildings (Existing and Proposed).

Quarters No. 1, 1,312 square feet, existing.

Quarters No. 2, 686 square feet, replacement, 1,312 square feet.

Quarters No. 3, 1,216 square feet, replacement, 1,312 square feet.

Quarters No. 4, 900 square feet, existing.

Quarters No. 5, 1,377 square feet, existing.

Equipment Shed, 3,420 square feet, open type, existing.

Equipment Shed, 3,420 square feet, open type, existing.

Equipment Building, 1,950 square feet, closed type, existing.

Shop, Automotive and equipment, 2,000 square feet, construction.

Storage Building, 1,872 square feet, existing.

Grain and Fertilizer Building, 893 square feet, existing.

Paint and Oil Building, 600 square feet, construction.

Lumber Storage Building, 600 square feet, existing.

Dynamite Building, 140 square feet, construction.

Trailer, 224 square feet, existing, temporary.

Office, 1,740 square feet, construction.

242. Construction Justifications.

Plans are to retain the office on the refuge and provide living quarters for five classified employees. All residences except Quarters No. 4 on Keaton Tower Road will be located in the Refuge Headquarters Area. Quarters assignment normally will be to the Refuge Manager, Assistant Manager, Clerk, Aid, and Forester. However, such assignments will change from time to time. A limited number of private quarters is available in the Noxubee area, but would not satisfy the need of the entire refuge staff. Non-classified employees normally will be local persons owning their homes near the refuge.

Adequate storage space is planned for the 31 items of equipment listed in Exhibit 3-I and including 4 pickups, 1 station wagon, 4 four-wheel drive jeeps, 3 crawler tractors, 6 wheel tractors, 3 crawler tractors (specialized), 4 trucks, road grader, dragline, 1 boat and motor, 1 overhead loader, and miscellaneous items. Storage space is planned also for related equipment attachments such as disks, plows, planters, etc.



Photo 11 (R 14-61, Exp. 6)  
Quarters No. 2, scheduled for replacement



Photo 11a (R 2-59, Exp. 20)  
Quarters No. 3, scheduled for replacement



Photo 12 (R 3-59, Exp. 30)  
Open type equipment shed, 114' x 30' (Noxubee design)

## 25. Roads, Trails, Fences, Utilities

### 251. Roads and Trails.

Fifty miles of gravel-surfaced, county-maintained roads are located on the Noxubee Refuge. The refuge presently maintains 38 miles of dirt roads designed for speeds of from 15 to 25 miles per hour. The refuge, also, has 51 miles of roads consisting of abandoned county roads, logging trails and fire breaks that receive a very limited amount of maintenance. Thirty-five additional miles of roads and trails (Exhibit 2-A, Base Map), are recommended for an adequate road system. These roads would be located at sites of existing fire lanes and logging trails which are now usable as roads only during dry weather. Clearing, grubbing and ditching will be required in the construction. Approximately 25 bridges and 140 culverts are required for the existing roads and for the new road construction.

252. Fences.

Livestock trespass is a major problem at Noxubee. Public lands, which include extensive acres administered by the U. S. Forest Service, Mississippi State University, and the refuge, traditionally are grazed by free-roaming livestock, property of adjacent landowners. Although stock laws are in existence, enforcement against livestock trespass is considered impractical if not impossible.

A fencing program was initiated along with the development of agricultural land giving protection to the production of waterfowl food. The major agricultural areas presently are enclosed with approximately 21 miles of 4-strand barbed wire fence.

Future fence construction should be of 4-strand heavy barbed wire with treated posts 10 feet apart and placed on the refuge boundary line, except for fences needed to protect future agricultural development prior to completion of the boundary fence. Fencing to exclude interior tracts will be as emergency measures only. Total boundary length, as included with proposed acquisition, is approximately 58 miles, that being the recommended fence construction project. However, boundary fencing will not solve trespass problems evolving from the interior tracts; and during the interim for land acquisition, temporary fences will be constructed.

253. Utilities.

Telephone service at Noxubee is provided by the Southern Bell Telephone Company. The refuge is on a party line with two Mississippi State University telephones and seven service phones, including one at the refuge office and six stationed at residences of refuge employees. However, this arrangement is considered adequate. No construction is recommended.

Electrical service is provided by the Four-County Electrical Power Association and is considered adequate. No construction is recommended.

254. Summary of Recommended Construction of Roads, Trails, Fences,  
Utilities, Etc.

1. Roads, 35 miles
2. Bridges, 25 each
3. Culverts, 140 each
4. Fences, 58 miles

Estimated cost and priority of construction are listed in  
Section 4, Budgetary (Recapitulation of Cost, Exhibit 4-A).

## 26. Recreation

### 261. Present Conditions and Justifications.

The existing Bluff Lake Recreational Area presently is managed and maintained by the Mississippi Game and Fish Commission. The one residence is used to quarter the State employee assigned to the area. Other facilities include several picnic tables, barbecue pits, outside toilets and storage building of sub-standard quality, (Photos 13 and 13a), outside water faucet and a concrete slab boat launching dock.

Present recreational facilities are used fully and often taxed to the point of inadequacy. An estimated daily average of 250 people currently use the area on weekends from early spring until late fall with an excess of 1,000 persons visiting the area on various days during the summer. Anticipation is that, with expansion of recreational facilities and areas, use will increase proportionately.

Facilities recommended for construction will be of brick veneer or concrete, as applicable, except for picnic shelters which will be wooden of rustic design.

Recreational facility expansion includes the enlargement of the Bluff Lake Area No. 1 (Exhibit 2-H) and development of Recreational Area No. 2 located on the proposed Loakfoma Lake (Exhibit 2-I).

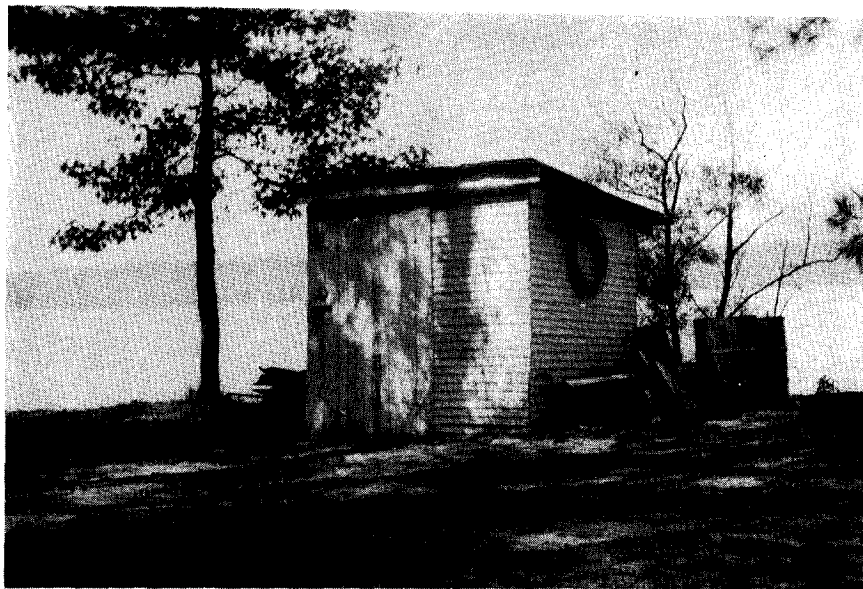


Photo 13 (R 14-61, Exp. 19)  
Sub-standard storage building at Bluff Lake Recreation Area.

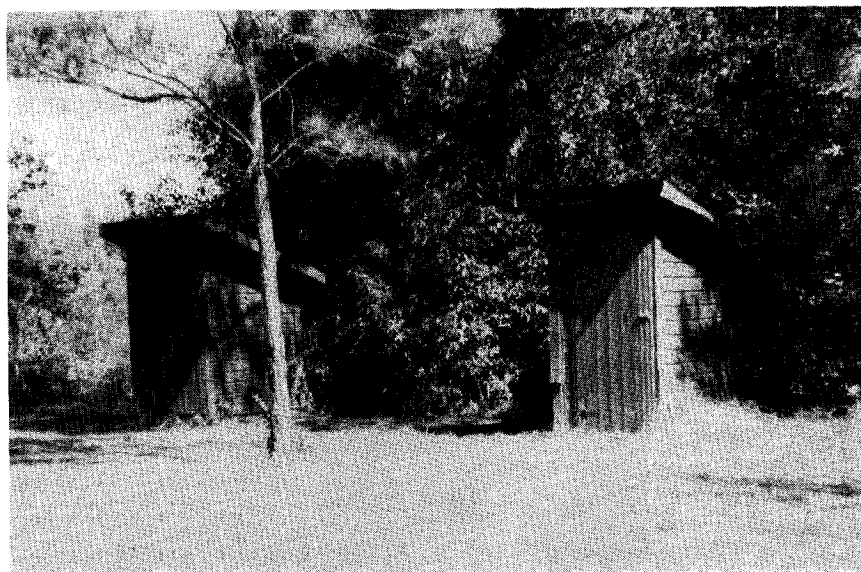


Photo 13a (R 14-61, Exp. 18)  
Sub-standard toilets at Bluff Lake Recreation Area.

262. Recommended Construction.

262.1 Recreational Area No. 1 (Bluff Lake).

Shelters (2). 30' x 40', open sides, concrete floor, frame construction, barbecue pit.

Restrooms (2). 10' x 20', septic tank, combination men and women.

Bath House (1). 56' x 40', concession stand, 38 dressing rooms, 2 toilets and 2 showers for women, 2 showers, urinal and toilet for men, 2 toilets outside for public, shelving for 700 baskets.

Well (1). 6" x 800', pump, tank.

Picnic Tables (50). Concrete.

Barbecue Pits (25). Coal or wood.

Garbage Disposal (20). Galvanized cans, locked on concrete base.

262.2 Recreational Area No. 2 (Loakfoma Lake).

Shelter (1). 30' x 40', concrete floor, open sides, barbecue pit.

Restroom (1). 10' x 20', septic tank, combination men and women.

Well (1). 6" x 800', pump and tank.

Ramp (1). Boat launching, concrete.

Picnic tables (25). Concrete.

Barbecue pits (12). Coal or wood.

Parking Lot (1). Autos w/boat trailers; access road to launching ramp.

Estimated cost and priority construction for both Recreational Areas 1 and 2 are listed in Section 4, Budgetary (Recapitulation of Cost, Exhibit 4-A).

### 3. Operation

#### 31. Habitat Management

##### 311. Water Management

311.1 General. The Noxubee Refuge is drained by the Noxubee River and its tributaries: Loakfoma, Lynn, Jones and Oktoc Creeks. These creeks and lesser streams leading into them are the chief sources of water supply. Rainfall influences considerably water supply from the above streams as well as being the sole source available to certain refuge impoundments.

Existing and proposed water facilities include two permanent impoundments, six green timber reservoirs, one water supply reservoir and several dewatering field impoundments of both permanent and temporary nature (Exhibit 3-A, Land Use Map). In addition to the above water areas, existing on the refuge are 78 water "holes" constructed for use by upland game and deer, and 25 similar areas are planned as development items.

The average annual precipitation of 51 inches, due to its pattern of rainfall, creates certain water management problems. Heaviest rainfall normally occurs January through April. Late winter and spring flood waters have topped the Bluff Lake levee on several occasions causing considerable damage (Photo No. 14). Flood waters must be considered in development and maintenance of impoundments and in water management. The months of June through October normally are the period of lowest rainfall and water supply may be inadequate to maintain desired water levels in permanent pools and flood dewatering impoundments including green timber reservoirs.

Prior to the construction of Bluff Lake and the establishment of the refuge, waterfowl use of the area was extremely limited. Since that time, a steady increase in waterfowl use has been evidenced. Subsequent construction of field impoundments and green timber reservoirs has attracted a current wintering population of waterfowl to a peak of approximately 100,000 ducks (Exhibit 3-B, Wildlife Population Summary).

Beavers create an important water management problem. Flooding caused by beaver dams has killed a large acreage of valuable hardwood timber and threatens additional timber lands (Photo No. 15). Although beaver activities interfere with water movement, resultant ponds rapidly establish natural stands of smartweed, millet, cattail, bulrush, lotus, etc., and these areas will be considered in both water and forestry management.



Photo 14  
Flood Water pouring over North Levee of Bluff Lake, 1951.



Photo 15  
Beaver Dam impoundment in Bottom Land Hardwood.

With the exception of the upland game water "holes" and one water supply reservoir, all water management will be devoted toward waterfowl food production and utilization and provision for waterfowl resting areas. Secondary consideration will be given to fishery management in Bluff Lake and Loakfoma Lake.

### 311.2 Permanent Impoundments

311.21 Bluff Lake. Bluff Lake was constructed in the early stages of the refuge development. It is the largest impoundment planned on the refuge consisting of approximately 1,200 surface acres and has an average depth of about four feet. Jones Creek and Oktoc Creek, having a combined watershed area of approximately 200 square miles, flow through Bluff Lake thus providing an adequate water supply except during extremely dry periods.

Excess water from Bluff Lake flows through a concrete spillway at the south end of the levee and a natural spillway located at the west end of the north levee into Noxubee River and Oktoc Creek respectively. The Doyle Arm section of the lake provides another natural spillway for drainage in Loakfoma Creek.

The main outlet from Bluff Lake is the concrete spillway (Photo No. 16) which flows into Oktoc Creek. This structure is 74 feet wide with a top elevation of 221.5' M.S.L.

Water levels of Doyle Arm, the southernmost part of Bluff Lake, may be managed independently of the Bluff Lake levels by a stoplog control structure (Photo No. 17) located at the roadway fill which separates these units.

Water levels in Bluff Lake may be lowered to five feet below spillway elevation by removing stoplogs in the "little spillway," (Photo No. 18) a 5' by 5' concrete culvert through the east levee. Water released from Bluff Lake through the "little spillway" may flow directly into Green Timber Reservoirs 1 and 2 or such water may be diverted through a diversion ditch into Oktoc Creek. Under normal summer weather conditions, water levels from full pool stage may be lowered two feet through "little spillway" in eight days and as much as three feet in twenty days (Refuge records, July 1954 when slightly over 3" of rain fell during the dewatering period). Based on past experiences, late fall and winter rains always are sufficient to bring lake levels from the de-watered state to above spillway elevation in a relatively short length of time. Partial to complete refilling of the lake normally can be accomplished by releasing water stored in beaver dam impoundments.

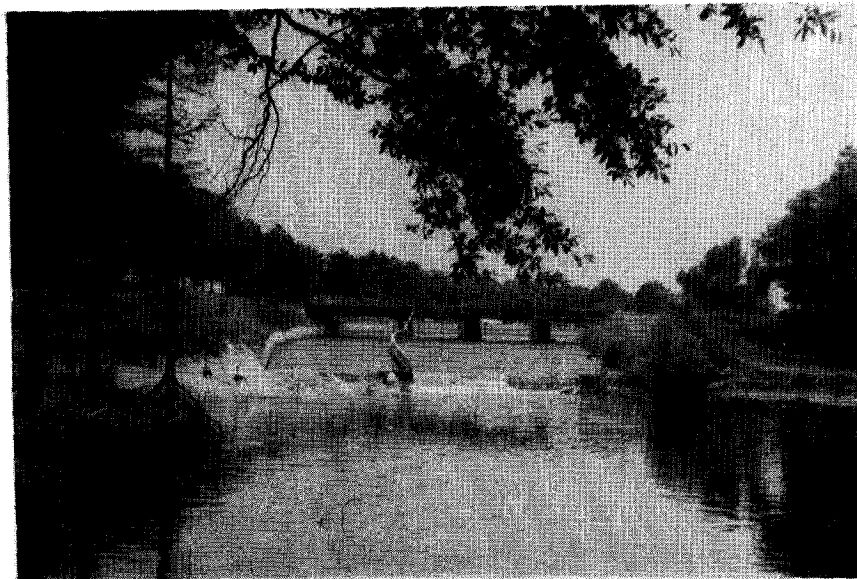


Photo 16 (R 11-61, Exp. 8)  
Big Spillway of Bluff Lake



Photo 17 (R 11-61, Exp. 25)  
Doyle Arm Drop Inlet, Water at a minus .3'



Photo 18 (R 11-61, Exp. 24)  
Little Spillway - Bluff Lake



Photo 19 (R 15-60, Exp. 7)  
Volunteer Wildmillet on drawdown margin of Bluff Lake

For plant composition in Bluff Lake, refer to "Plant Composition by Species and Their Relative Importance in Water Management Areas" (Exhibit 3-C).

Lowering of the water level in Bluff Lake during the summer months produces a rather large acreage of mud flats (Exhibit 2-G, Summary, Existing and Proposed Impoundments) that produces emergent waterfowl food plants such as wild millet, smartweed, etc. (Photo No. 19). The lowered water level also facilitates rough fish control and levee maintenance and reduces, to some degree, levee erosion. Aquatic plant production is not reduced significantly by lowering water levels not to exceed three feet below spillway level.

Water management in Bluff Lake is planned to hold pool level at spillway elevation until July 1. During the early part of July, water will be released by removing stoplogs in "little spillway" to lower lake level not in excess of three feet. Prior to October 15, "little spillway" will be closed and refilling of the lake will be accomplished as rapidly as possible in order to obtain an adequate water supply to flood Green Timber Reservoirs 1 and 2. Water levels in the Doyle Arm portion of Bluff Lake should be lowered beginning about May 1 to facilitate crop plantings. This operation will require installation and operation of pumping facilities.

311.22 Loakfoma Lake. Loakfoma Lake is planned for construction. This lake will be located on Loakfoma Creek and its backwaters at full stage will come in proximity with waters in the Doyle Arm section of Bluff Lake. This lake, consisting of 615 acres at spillway level, affords an opportunity of drawdown mud flat exposure (Exhibit 2-G). Water supply is surface run-off from approximately 7,700 acres offering feasibility to water manipulation for production of aquatic and emergent species. Initial management of Loakfoma Lake will include the establishment of suitable aquatic species.

Loakfoma Lake and surrounding habitat will be managed primarily for waterfowl with special emphasis on Canada geese. Water manipulation is planned for an early spring drawdown not to exceed one foot to facilitate spring plantings on adjacent agricultural lands. After plantings are accomplished, a full pool stage may be resumed. During the early part of July, the water level again may be lowered not to exceed two feet below spillway level to encourage the production of natural waterfowl foods and permit seeding of mud flats. Refilling of the lake will commence as soon as possible after mud flat seeding and natural food crops have matured, but no later than October 15.

### 311.3 Green Timber Reservoirs

311.31 Green Timber Reservoirs 1 and 2. These reservoirs presently are in operation and involve 400 acres and 340 acres respectively

(Exhibit 2-G), of forest species bearing mast readily utilized by ducks. For a general indication of plant composition in Green Timber Reservoirs 1 and 2, refer to Exhibit 3-C.

Water supply for Green Timber Reservoirs 1 and 2 is from Oktoc Creek through "little spillway" of Bluff Lake, and normally the supply is adequate to obtain gradual flooding as desired. Reservoir 1 is located immediately below Bluff Lake and water flows through this area into Reservoir 2 as controlled by the Reservoir 1 water control structure.

Water management for Green Timber Reservoirs 1 and 2 is planned for flooding both areas in the latter part of October and dewatering in the latter part of February. After the first killing frost or early in the waterfowl season, water controls of Reservoir 1 should be closed and water from Bluff Lake released into the area. When a sufficient area of Reservoir 1 is filled, water should be released into Reservoir 2. It may be desirable to fill the lower limits of each reservoir simultaneously.

311.32 Green Timber Reservoir No. 3 (Oktoc Creek). This reservoir is planned for construction. It crosses Oktoc Creek and contains 560 acres at spillway elevation. The forest type is similar to that of Green Timber Reservoirs 1 and 2. Species are indicated in Exhibit 3-C.

This impoundment has first option of the water supply from Oktoc Creek. Complete water control is possible except during flood conditions and possibly during extremely dry periods. Fall flooding of this reservoir is planned to begin early in October so as to obtain spillway level by mid-waterfowl season and remain at full pool stage until late February when the area will be completely drained.

311.33 Green Timber Reservoir No. 4 (Jones Creek). This reservoir is planned for construction and is of high priority in the proposed green timber reservoir developments. Its surface area at spillway level will involve 705 acres (Exhibit 2-G) of forest type similar to Green Timber Reservoirs 1 and 2. Species composition is as indicated in Exhibit 3-C.

Water supply chiefly is from the Jones Creek watershed consisting of approximately 9,000 acres. Jones Creek is a constant source of water supply but is inadequate for complete water control during dry periods since water movement is meager. Water will be available from the proposed storage reservoir containing 400 acre feet of water located on a Jones Creek tributary. However, this green timber reservoir will have a secondary priority to the Jones Creek field impoundment for stored water. Water management is planned to raise

water levels to full creek bank stage in September. Flooding of timber lands within the reservoir will commence in early October and water levels will be raised to spillway elevation as rapidly as possible. Impounded water will be released in late February to prevent timber damage.

311.34 Green Timber Reservoir No. 5 (Dry Creek). This reservoir, planned for construction, will have a surface area of 220 acres at spillway elevation (Exhibit 2-G). The timber type within this impoundment is excellent insofar as species for production of mast valuable for waterfowl food. Species included are those listed in Exhibit 3-C.

Water supply is run-off from the Dry Creek Watershed consisting of 3,000 acres. Dry Creek is an intermittent stream, and water control in this reservoir is dependent upon rainfall and surface run-off.

Water management is planned to raise water levels to full creek bank stage in September. Flooding of timber land within the reservoir will commence in early October and water levels will be raised to spillway elevation as rapidly as possible. Reservoir water will be released in late February.

311.35 Green Timber Reservoir No. 6 (Loakfoma Creek). This reservoir is planned for construction. It crosses Loakfoma Creek and contains 215 surface acres at spillway elevation (Exhibit 2-G). Forest species, although less desirable than in other green timber reservoirs insofar as ratio, are as those indicated in "Plant Composition by Species and Their Relative Importance in Water Management Areas" (Exhibit 3-C).

Water supply is from rainfall run-off within the Loakfoma Creek watershed consisting of 6,000 acres. Loakfoma Creek is an intermittent stream and water control in Green Timber Reservoir No. 6 is dependent primarily upon rainfall and surface run-off. Normally the water supply should be adequate for gradual filling during the fall and early winter months.

Water management is planned for flooding of this reservoir to begin early in October and water levels to rise to spillway elevation as rapidly as possible. Water will remain at full pool stage until the latter part of February when the area will be completely de-watered.

311.4 Field Impoundments. Field impoundments (Photo No. 20) are located in the Smith Fields, Morgan Field, Keaton Tower Field and the Prisock area (Farm Units 12, 14, 16, 23, 19, respectively). The acreage of each impoundment is listed in Exhibit 2-G. Surrounding



Photo 20 (R --57, Exp. 18)  
 Small Impoundment - Smith Field No. 2 collects rain  
 water to inundate millet, beans and etc.



Photo 21 (R 2-61, Exp. 14)  
 Canada Goose Habitat - Morgan Field showing shallow  
 impoundment in the distance.



Photo 22 (R 16-60, Exp. 16)  
Grain Sorghum in Morgan Field - Cooperatively Farmed.



Photo 23 (R 2-60, Exp. 8)  
Pearl Millet - Jones Creek Impoundment

or adjacent to each field impoundment is additional agricultural land (Photo No. 21) that is planted and/or cultivated annually in waterfowl food crops. Within the impoundments agricultural crops, such as corn, grain sorghum, millet, etc. (Photo No. 22 and 23) are planted whereas the crops outside the reservoirs will include a variety of browse in addition to grain crops.

Waterfowl response to field flooded crops is encouraging. Under this type management, crops planted in isolated fields receive complete utilization.

Water supply for field impoundments is rainfall and filling of these reservoirs is entirely dependent upon the run-off in each respective watershed. The proposed water supply reservoir located on a Jones Creek tributary will be a source of water for the Jones Creek Impoundment thus making possible complete water control for this reservoir.

Water management of these areas consists of complete drainage for the production of waterfowl food crops and fall flooding of the agricultural crop to facilitate utilization. The ponded waters serve also as attraction and resting areas for the individual fields.

Schedules of water levels are complete de-watering in late March, or as soon as waterfowl use becomes insignificant, and refilling as soon after November 1 as rainfall will permit.

311.5 Water Supply Reservoir. This reservoir is planned for construction. The site is located on a Jones Creek tributary approximately  $\frac{1}{2}$  mile southwest of the Jones Creek Impoundment. This reservoir has a full stage capacity of 400 acre feet, (Exhibit 2-G). The stored water will be used annually as a principal supply for the Jones Creek Field Impoundment and the remaining stored water will be released into the Green Timber Reservoir No. 4.

Water management schedule is for drainage as desired for the water supply in fall flooding of the Jones Creek Impoundment and Green Timber Reservoir No. 4. Water control structures should be closed immediately when Jones Creek Impoundment and Green Timber Reservoir No. 4 have reached the desired flooding stage. Refilling of the Supply Reservoir will be chiefly from the late winter and spring rains and the reservoir water level will remain as nearly as possible at spillway elevation during the summer months and until the water is needed in the scheduled flooding of the impoundments.

311.6 Wildlife Ponds. A large portion of Noxubee has insufficient drinking water for wildlife during the summer and fall months. One water "hole" approximately 5 feet deep, 10 feet wide and 50 to 100 feet long (Photo 24) is planned for each quarter section in

those areas of the refuge lacking a permanent water supply. Wildlife ponds such as these are inexpensive to construct, and management will require no water level manipulation. Water level will remain at spillway elevation or as near to this level as rainfall will permit.

311.7 Marshland. This section is applicable to Noxubee only in the broad sense. The shallow backwaters of Bluff Lake and relatively large areas where drainage has been severely impeded by beaver dams will be treated as marshlands. Marshland plants include smartweed, millet and other desirable species. However, cattail, primrose and lotus are the predominant species.

A large part of the areas bearing cattail will be included in Green Timber Reservoirs 3 and 4. Levee construction will make the marshlands more accessible and facilitate pest plant control. Marshland management will consist primarily of pest plant control measures and mechanical practices designed to promote desirable plant growth. Pest plant control will involve late winter and early spring burns to expose the young tender growth to herbicidal treatment. Aerial spraying will be required on certain areas and disking or plowing measures will be employed during dry periods for weed control and promotion of desirable plant growth.



Photo 24 (R 11-61, Exp. 4)  
Water Hole in NW 1/4 Sec. 11 T 17 R 13

311.8 Summary. In general terms, the recommended water management for Noxubee is summarized in the table below:

<u>Area</u>	<u>Spillway Elevation</u>	<u>Drawdown Date</u>	<u>Max.</u>	<u>Flooding Date</u>	<u>Remarks</u>
Bluff Lake	221.5' msl	July	3 ft.	On or before October 15	Doyle Arm drawdown by May 1
Loakfoma Lake	226.0' msl	July	2 ft.	On or before October 15	An early spring drawdown not to exceed 1' is recommended to facilitate spring planting.
G.T.R. 1 & 2		Feb.	100%	October	
G.T.R. 3	227.0' msl	Feb.	100%	October	Water levels to be raised to full creek bank stage in Sept.
G.T.R. 4	232.0' msl	Feb.	100%	October	" " " "
G.T.R. 5		Feb.	100%	October	" " " "
G.T.R. 6	251.0' msl	Feb.	100%	October	" " " "
Field Impoundments		Feb. or March	100%	November	
Supply Reservoir	255.0' msl	As needed for pool flooding		As water is available	
Wildlife Ponds		None		Constant	

EXHIBIT 3-B  
WILDLIFE POPULATION SUMMARY  
NOXUBEE REFUGE

WATERFOWL PEAK POPULATIONS (1950 - 1960)

SEASON	CANADA GEESE	MALLARDS	COOTS	PEAK DUCK POPULATION	DAY USE ALL SPECIES
1950-1951	13	6,000	3,000	11,009	
1951-1952	8	3,500	2,500	5,000	16,700
1952-1953	21	3,000	5,000	4,000	586,648
1953-1954	40	3,200	1,200	4,535	504,344
1954-1955	150 (short stay)	14,000	2,000	21,570	1,864,714
1955-1956		24,000	2,000	46,258	3,646,294
1956-1957	90	30,000	7,000	51,990	3,761,786
1957-1958	68	25,000	7,000	36,490	3,238,060
1958-1959	113	45,000	5,000	63,820	6,340,802
1959-1960	19	20,000	3,000	33,270	2,682,324
1960-1961	102	70,000	2,000	105,000	4,501,444

UPLAND BIRD PEAK POPULATIONS (1956-1960)

SPECIES	1956	1957	1958	1959	1960
Turkey		100	250	250	250
Quail		1,000	800	2,000	2,000

BIG GAME POPULATIONS (1956-1960)

	1956		1957		1958		1959		1960*	
SPECIES	PEAK	PROD.	PEAK	PROD.	PEAK	PROD.	PEAK	PROD.	PEAK	PROD.
Deer, White-tail	1,000	250	1,050	--	1,000	250	1,000	250	1,800	1,000

\* The 1960 estimate for both peak population and production is considered high.

SMALL MAMMAL PEAK POPULATIONS (1956-1960)

SPECIES	1956	1957	1958	1959	1960
Raccoons	2,000	2,000	2,000	2,000	2,000
Skunk	100	100	100	100	100
Mink	100	200	200	200	200
Fox, Gray	1,000	1,000	1,000	1,000	1,000
Fox, Red	200	500	500	200	200
Squirrel, Gray	15,000	75,000	75,000	30,000	30,000
Squirrel, Fox	1,000	6,000	6,000	3,000	3,000
Rabbit	8,000	45,000	18,000	5,500	5,500
Opossum	200	200	200	200	200
Bobcat	60	100	100	100	100
Beaver	800	800	1,000	1,000	1,000
Otter	25	10	10	10	--
Muskrat	800	2,000	2,000	1,000	1,000

Population estimates based on Narrative Reports Records.

# EXHIBIT 3-C

## PLANT COMPOSITION BY SPECIES AND THEIR RELATIVE IMPORTANCE IN WATER MANAGEMENT AREAS

### Bluff Lake

<u>Plant Species</u>	<u>Acreage</u>	<u>Waterfowl Value*</u>
Lotus - <u>Nelumbo lutea</u>	300	Poor
Brasenia - <u>Brasenia schreberi</u>	50	Good
Water Primrose - <u>Jussiaea repens</u>	40	Poor
Water Lily - <u>Nymphaea odorata</u>	Scattered	Poor
Muskgrass - <u>Characcae</u> spp.	600	Good
Pondweeds - <u>Potamogeton</u> , spp., <u>P. nodosus</u>	Scattered	Good
Arrow-arum - <u>Peltandra virginica</u>	Sparse	Fair
Three-square - <u>Scirpus americanus</u>	40	Good
Bulrush, soft stem - <u>Scirpus validus</u>	Scattered	Good
Cattail - <u>Typha</u> spp.	400-500	Poor
Plumegrass - <u>Erianthus giganteus</u>		None
Smartweed - <u>Polygonum</u> spp.	Drawdown zone	Good
Wild Millet - <u>Echinochloa crusgalli</u>	Drawdown zone	Good
Sedges - <u>Cyperus erythrorhizos</u> chiefly, with some <u>C. esculentus</u>	Drawdown zone	Good

# EXHIBIT 3-C (Cont'd)

## Undercover Species \*\*\*

<u>Shrubs Species</u>	<u>Occurrence</u>	<u>Waterfowl Value</u>
Smooth Sumac, <u>Rhus glabra</u>	Most soils except heaviest	Good
Buttonbush, <u>Cephalanthus occidentalis</u>	Heavy soils on wet sites	Fair
Hawthorn, <u>Crataegus</u> sp.	Well-drained ridges and flats	Low
False Indigo, <u>Amorpha fruticosa</u>	Heaviest soils on moist sites	Poor
American Elder, <u>Sambucus canadensis</u>	Most soils except heaviest	--
<u>Wood Plants</u>		
Supple-jack, <u>Berchemia scandens</u>	Most soils, except excessively wet	Good
Ladies'-eardrops, <u>Brunnichia cirrhosa</u>	Most soils, except excessively wet	Fair
Grape, <u>Vitis</u> sp.	Most soils, except excessively wet	Low
Morning-glory, <u>Ipomoea</u> sp.	Light soils with good drainage	Low
Poison Ivy, <u>Rhus radicans</u>	Most soils, except excessively wet	Low
Blackberry, <u>Rubus</u> sp.	Most soils, except excessively wet	Poor
Dewberry, <u>Rubus</u> sp.	Variety of soils, usually well-drained	Poor
Honeysuckle, <u>Lonicera japonica</u>	Light soils with good drainage	--
Red-berried Moonseed, <u>Cocculus carolinus</u>	Most soils, except excessively wet	--
Trumpet-creeper, <u>Campsis radicans</u>	Most soils, except excessively wet	--
Wild Bean, <u>Apios americana</u>	Most soils, except excessively wet	--
<u>Forbs</u>		
Smartweed, <u>Polygonum</u> spp.	On wettest sites	High
Wildmillet, <u>Echinochloa crusgalli</u>	On wettest sites	High
Ragweed, <u>Ambrosia artemisiifolia</u>	Most soils except excessively wet	Good
Dock, <u>Rumex crispus</u>	Many soils	Low
Poke, <u>Phytolacca americana</u>	Most soils along openings	Low
Dayflower, <u>Commelina virginica</u>	Heavy clays	Poor
Goldenrod, <u>Solidago altissima</u>	Most soils except excessively wet	--
Prairie-mimosa, <u>Desmanthus illinoensis</u>	Most soils, except excessively wet	--
Sumpweed, <u>Iva ciliata</u>	Most soils, except excessively wet	--

EXHIBIT 3-C (Cont'd)

Green Timber Reservoirs

<u>Forest Species**</u>	<u>Occurrence</u>	<u>Waterfowl Value</u>
Water Oak, <u>Quercus nigra</u>	Widely on ridges and high flats	Excellent
Willow Oak, <u>Quercus phellos</u>	Widely on ridges and high flats	Excellent
Nuttall Oak, <u>Quercus nuttallii</u>	Widely on flats or heavy soils	Excellent
Cherrybark Oak, <u>Quercus falcata</u>	Widely on well-drained loamy sites	Excellent
Laurel Oak, <u>Quercus laurifolia</u>	Wet flats and low ridges	Excellent
Shumard Oak, <u>Quercus shumardii</u>	Restricted to well-drained ridges	Excellent
Cow Oak, <u>Quercus prinus</u>	Well-drained loamy soils	Good
White Oak, <u>Quercus alba</u>	Scattered on well-drained soils	Good
Overcup Oak, <u>Quercus lyrata</u>	Poorly-drained, heavy soils	Good
Sweet gum, <u>Liquidambar styraciflua</u>	All sites except the very wet	Good
Water Tupelo, <u>Nyssa aquatica</u>	Heavy soils of low flats	Good
Hackberry, <u>Celtis occidentalis</u>	All soils except the very wet	Good
Honeylocust, <u>Gleditsia triacanthos</u>	All soils except the very wet	Good
Cypress, <u>Taxodium distichum</u>	Wettest sites	Good
Holly, <u>Ilex opaca</u>	Better-drained ridges	Good
Dogwood, <u>Cornus florida</u>	Best drained ridges (Rarely found)	Good
Possum-tlaw, <u>Ilex decidua</u>	Heavy clays of low flats	Good
Bitter Pecan, <u>Carya aquatica</u>	Heavy soils on low flats	Fair
Beech, <u>Fagus grandifolia</u>	Best drained ridges	Fair
Eastern Redbud, <u>Cercis canadensis</u>	Better drained sites	Poor
Red Mulberry, <u>Morus rubra</u>	Scattered widely, not on wet sites	Poor
Persimmon, <u>Diospyros virginiana</u>	Scattered widely, not on wet sites	Poor
Ashs, <u>Fraxinus</u> spp.	Common flats	Poor
Elms, <u>Ulmus</u> spp.	Most soils, except wettest	Poor
Cottonwoods, <u>Populus deltoides</u>	Occasional tree along fringes	Poor
River Birch, <u>Betula nigra</u>	Along stream fringes	Poor
Hickories, <u>Carya</u> spp.	Ridges and high flats	Poor
Red Maple, <u>Acer rubrum</u>	Most soils, except wettest	Poor
Boxelder, <u>Acer negundo</u>	Ridges and high flats	Poor
Yellowpoplar, <u>Liriodendron tulipifera</u>	Best drained ridges	Poor
Pine, <u>Pinus taeda</u>	Best drained ridges	Poor
Pine, <u>Pinus echinata</u>	Best drained ridges	Poor
Sycamore, <u>Platanus occidentalis</u>	Widely on stream fronts	Poor
Ironwoods, <u>Ostrya virginiana</u>	Most soils, except wettest	Poor
Swamp-privet, <u>Forestiera acuminata</u>	Heavy clay and low flats	Poor

FOOTNOTES - EXHIBIT 3-C

\* Evaluation Based on:

Martin, A. C. and Uhler, F. M., 1951. Food of Game Ducks in the United States and Canada. Research Report 30. Fish and Wildlife Service, United States Department of the Interior.

Rawls, C. K. Jr. \_\_\_\_\_. Reelfoot Lake Waterfowl Research. Final Report Federal Aid in Wildlife Restoration, Project W-22-R. Tennessee Game and Fish Commission.

Martin, A. C.; Zim, H. S.; Nelson, A. L., 1951. American Wildlife and Plants.

Bureau personnel observations of waterfowl feeding habits on the Noxubee Refuge without benefit of detailed food studies.

\*\* The average basal area per acre for all species in green timber reservoirs is 77.4 square feet per acre with an estimated volume of 7,453 board feet (International  $\frac{1}{4}$ " Rule). Silvicultural treatments are discussed under the Timber Management Section.

\*\*\* Maisenhelder, Louis C., 1958. Understory Plants of Bottom land Forests. Southern Forest Experiment Station. Forest Service, U. S. Department of Agriculture.

### 312. Cropland Management

312.1 General. Agricultural lands are an integral part of the refuge's waterfowl and upland game habitat. Waterfowl will receive the primary benefits from the farming program. However, many incidental benefits will accrue to upland game and deer from farming for waterfowl. The refuge's farming program also gives provision for upland game food plots in critical areas.

The Canada goose habitat on the refuge is confined primarily to Bluff Lake, Loakfoma Lake (proposed), and the agricultural land. The refuge's farming program is designed to give full benefits to Canada geese, but due to the large numbers of ducks and small numbers of geese wintering on the refuge, ducks presently utilize the major portion of crop yields.

Corn is the favored hot food of both ducks and geese and should be included in the planned rotation as soil capabilities and other conditions permit. Other waterfowl foods suitable to Noxubee's conditions are millet, soybeans, grain sorghum, buckwheat, small grain, ryegrass, fescue and other similar plants.

In general, Noxubee soils are inherently low in basic plant food elements, and applications of nitrogen, phosphate and potash are necessary for satisfactory crop production. Agricultural limestone in the amount of two tons or more per acre is required to neutralize (pH7) the farm lands.

The local agricultural economy, in some respects, is below that of the Delta sections of Mississippi; however, the owner-operator type farm that is prevalent in the Noxubee area indicates a higher prosperity than that of the sharecrop type of the Delta section. Prior to the 1930's, farmers' efforts were directed primarily toward cotton production. Soil depletion, low crop yields, inefficient farming methods, along with the cotton boll weevil, promoted disbandment of many acres of land previously farmed. The natural re-forestation of the major portion of this land to pine is a blessing now receivable in pine timber to the local economy. The owner-operator type farmer recently has reclaimed the most fertile agricultural lands for pasture, small grain and rowcrops. With up-to-date farming techniques, local farmers are again receiving fair returns from their labor and investments.

All lands subject to haying and grazing operations are being included in the farming program and will be cultivated periodically.

With the development of several refuge farming areas and the success of refuge farming operations, local interest in cooperatively farming Government land results in the demand exceeding the supply (Photos 25 and 26). Most of the requests for refuge farm land come from the Prairie Farming area approximately 20 miles east of the refuge. Farmers in this area generally are prosperous and their operations are extensive.

Soil capability classifications on Noxubee range from II through V. Only a few acres of Class II land are located on the refuge. Classes III and IV, and smaller acreages of Class V, are the predominant soils used for crop production. In general, the lands on Noxubee used for agricultural crops have a heavy clay subsoil that impedes internal drainage. Surface drainage along with applications of lime and mixed fertilizers is necessary to obtain satisfactory yields.

312.2 The Program. Cooperative farming is and will remain an integral part in the land management of the refuge for waterfowl food products (Exhibit 3-D Schedule of Rates). The division between cooperative farming and farming by refuge personnel will be governed by the need for food to be left in the field unharvested for waterfowl. In all cases, an effort will be made to provide adequate food for the expected population throughout a normal season. When program requirements can be filled by cooperative farming, farming by refuge personnel will be held to a minimum. Noxubee lands that are low in fertility, hazardous in nature and of high site value, normally will require farming by refuge personnel.

It is reasonable to assume that adequate waterfowl food can be produced and a balanced farming program conducted by managing two-thirds of the refuge's agricultural lands under cooperative farming agreements and the remaining acreage by refuge personnel farming. This ratio of cooperative and refuge farming applies to both development and post development periods. With development, including acquisition, approximately 3,000 acres will be farmed for waterfowl.

Corn, grain sorghum, soybeans, buckwheat, millet, small grain, ryegrass, fescue and white clovers (ladino, Louisiana White, White Dutch) are the principal crops that will be used in waterfowl food production. These crops are well adapted to the local soil and climatic conditions and are preferred waterfowl foods.

Corn is the earliest crop to be considered. It produces well providing weather conditions permit early planting so that the crop will mature prior to the seasons for bud worms, corn borers and other insects damaging the corn plant. The most desirable period for planting corn is April 15 through May. Grain sorghum and soybeans can be planted through June 30 and even later with a reasonable assurance of maturity prior to frost season. However, yields normally

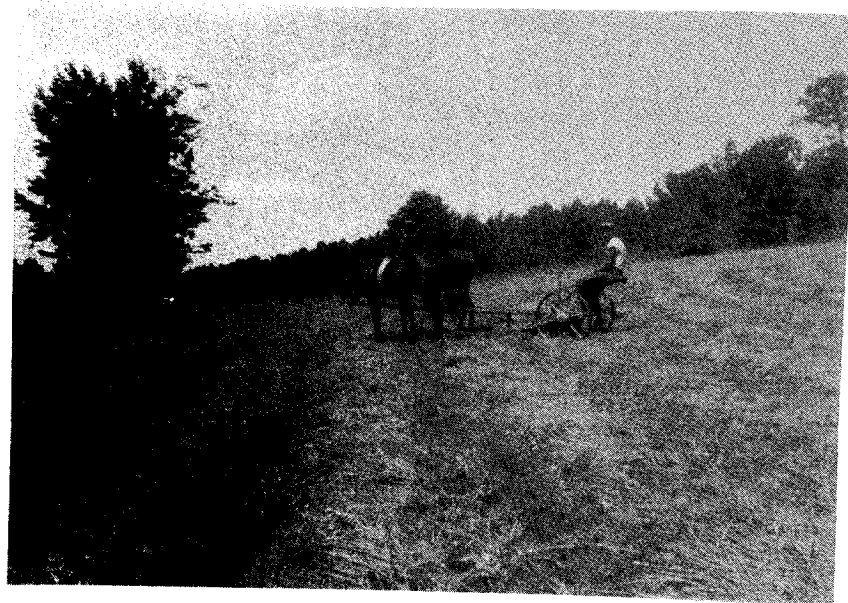


Photo 25  
Cooperative Farming Operation, 1949

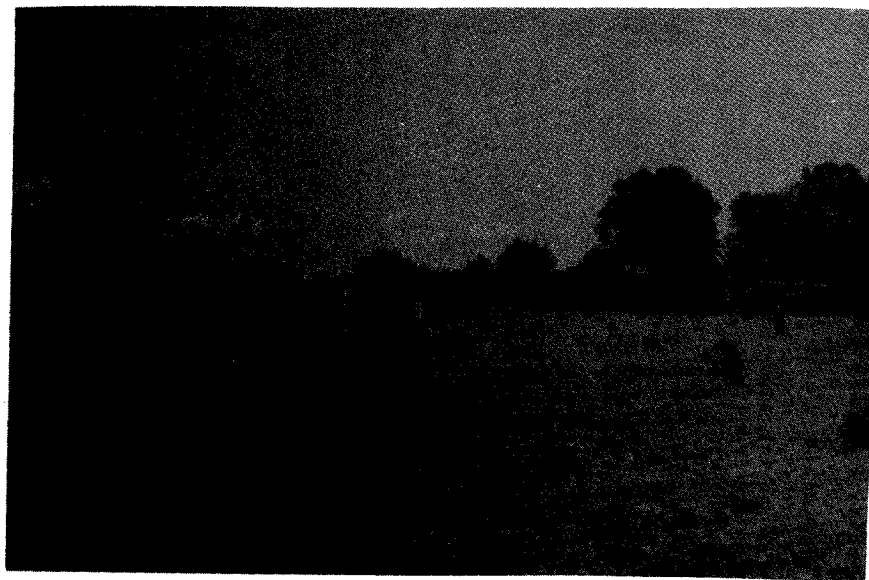


Photo 26 (R 6-59, Exp. 6)  
Cooperative Farmer, 1960

are less for late season plantings. Buckwheat with accompanying cover crops (if desired) should be seeded between July 20 and September 1, while August is the ideal month for planting millet or buckwheat.

Annual browse crops, including winter legumes and permanent pasture sods should be planted from September 1 through October 15. While this generally is true, small grain and ryegrass may be seeded successfully until December 15.

Within the guidelines of Section 3413c of the Wildlife Refuges Manual, cooperators and permittees will be selected by the refuge manager using sound judgment as the main criteria. Selections generally will be on a first come, first served basis and further screening will be according to personal character, the variety and acreage of crops desired, the adequacy of equipment and financial support either self or otherwise, which the cooperator may have available to properly complete any cooperative project worked out for him.

The land capability of each field will be the basic guide in determining the crop rotations (Exhibit 3-E, Land Use Capability Map, filed in Refuge office). In general, Class I land will be used in continuous rotation of cultivated crops. Class II and III lands will be used in rotation to provide for one-third to one-half of the land to be in soil improving crops, grasses or legumes each year. Wet soils, usually Class IIIW, IVW and VW, are hazardous and normally will be used for broadcast crops. However, these lands may be used when needed for rowcrops on selected sites. Under the rotations set forth above, it is necessary to seed a winter cover crop, preferably including a legume, on clean cultivated crop lands. The winter cover should be turned in the spring as a green manure crop. In cases of poor results from the cover cropping program, it will be desirable to lengthen the rotation to include additional soil improving crops. A general rotation recommended for Noxubee without winter cover crops is as follows:

Class II lands: One year soil depleting crops.  
One year soil improving crops.

Class III lands: One year soil depleting crops.  
Two years soil improving crops.

Class IV lands: One year soil depleting crops.  
Three years soil improving crops.

Class IIW, IIIW : May be farmed continuously in  
IVW and V (Wet lands) broadcast or rowcrops. Applications  
of commercial fertilizers will, in  
a large degree, determine crop yields.

The analyses of soil samples will be the basic criteria for determining fertilizer application. However, the plants to be grown will influence the rate of application as well as kind and ratio of plant foods.

312.3 Description of Individual Farming Units. The Land Use Map (Exhibit 3-A) depicts 28 land use compartments. Each compartment confining arable lands denotes the agricultural fields. The boundaries of each field are the results of physical features; past land use, land capabilities or anticipated land management. A number is assigned to each field and is identifiable by that number preceded by the respective compartment number.

Description of farming units on a compartment basis is not practical inasmuch as soil capabilities and usage are not confined to compartment boundaries. For descriptive purposes, farming areas are divided into three groups: present waterfowl habitat; potential waterfowl habitat; and upland game (including deer) plots. The acreage of each of these categories is listed by fields on the Land Use Map (Exhibit 3-A). Exhibit 3-A, in addition to the Land Use Map, lists individual fields by compartments indicating their respective acreages and major wildlife usage. Capability maps of the major farm areas are on file in the Refuge Office.

Waterfowl Habitat. The areas presently being farmed for waterfowl involve 996 acres of land located in Compartments 9, 11, 12, 14, 15, 16, 18, 19 and 23, and, in general, either are adjacent to Bluff Lake or include dewatering field impoundments. The soil capabilities are erratic and range from Class I to Class VI inclusive. The acreage of Class I soils is insignificant. Class II soils include areas of both upland and bottom land that normally are well drained, relatively fertile and capable of producing long season crops. These soils make up less than one-fourth of the farming area. The predominant soils are Classes III and IV with Class V being well represented. These soils involve both upland and bottom land with drainage normally determining their classifications. With few exceptions, they are nearly level, cold natured, acid and poorly drained. Surface textures range from loams to clays having a plastic clay subsoil. This group of soils includes also small areas of hill land with 5 to 10 percent slopes and moderate to severe erosion. The bottom land soils are best suited for the production of crops requiring a medium to short length growing season.

Potential Waterfowl Habitat. Refuge areas planned for renovations to a waterfowl habitat status fall into three categories, namely: abandoned agricultural lands, "pasture" lands, and timbered areas. The soils are similar in nature to those presently being farmed including Classes II, III, IV and V lands.

The abandoned lands include Fields 1, 2, 3 and 4, Compartment 23 (61 acres); Fields 4, 5, 6, 10, 11, 12, 13, 14, 15 and 16, Compartment 16 (144 acres); Fields 12 and 13, Compartment 19 (10 acres). The pasture area is located in Fields 1 through 23, Compartment 9 (305 acres). Renovation will require field enlargement, brush control, drainage, fertilization, soil amendments and the addition of organic matter.

The timbered lands planned for agricultural development involve 450 acres in proximity to Bluff Lake and the proposed Loakfoma Lake representing the principal expansion of Canada goose habitat. The "fields" are timbered with pine and pine-hardwood, ranging in size from pole to sawtimber with light, medium and full density. Renovation will require clearing operations, drainage, fertilization and soil amendments.

Upland Game Plots. Upland game plots totaling 397 acres are located in 20 of the 28 compartments and range in size from one acre to approximately 50 acres. The larger plots consist of hedgerows, small wooded areas, ditches and other features giving cover and seclusion to game species. Ground cover consists of native grasses and legumes as well as domestic plants in the most important areas.

## EXHIBIT 3-D

SCHEDULE OF APPROVED RATES  
Crop Division

Use	Unit	Cooperator	Government	Cash	Remarks
Rowcrops	Acres	75%	25%	\$3.00-5.00	*
Broadcast or drilled crops	Acres	75%	25%	\$3.00-5.00	*
Truck crops	Acres	75-66 2/3%	25-33 1/3%	\$15.00-20.00	*
Wild hay	Acres	25%	75%	\$.75	**
Cultivated hay	Acres	25%	75%	\$3.50 or \$.10-.20/bale	**
Improved Pasture	Acre/aum	25%	75%	\$1.00-1.50	
Wild Pasture	Acre/aum	25%	75%	\$.60	
Timber, logs	MBF				***
Timber Pulp	Cord				***
Fuel wood	Cord			\$.50-1.00	**
Timber, Post	each	80-75%	20-25%	\$.10-.15	**
Seed	Acre	75-50%	25-50%	\$10.00	*
Sand, gravel, etc.	Cu. Yd.			\$.10-.20	**
Pine Cones	Bushel		10% delivery price to extraction		**
Fur Animals					
Mink, Muskrat, Otter	Pelts	60-75%	25-40%		
Beaver, Fox, Raccoon, etc.	Pelts	90-100%	0-10%		

\* Cooperative farming on the share basis should net the Government 25% on agricultural crops grown. Special consideration in behalf of the cooperator or permittee may be in order in cases of cultivating

EXHIBIT 3-D (Cont'd)

hazardous land or land requiring special and costly preparation for crop production. Any cooperative agreement or special use permit not in accordance with the approved schedule of rates must be justified and have Regional Office concurrence. In cases of cooperatively grown hay, pasture, non-waterfowl food crops accruing entirely to producer, the cooperator will produce, as the Refuge's share, waterfowl food crops in equitable amounts to be in accordance with the approved schedule of rates.

\*\* 3-1400 may be issued when mutual benefits will be received and the market value of the material is insignificant.

\*\*\* See Timber Management Plan.

313. Grasslands.

Haying and grazing of refuge land will be incidental to other farming operations and used only as a management tool in the production of waterfowl foods and the improvement of wildlife habitat. The harvest of hay from permanent sod areas will, when possible, be incorporated into a cooperative farming program. However, cash sales for hay may be initiated when the harvest is advantageous to the management of the crop for waterfowl, deer, or upland game. Care must be exercised not to permit hay harvests that will interfere with the nesting of turkey or quail. Haying may be included in the management of all fields on the refuge, periodically; and the designation of individual fields for hay purposes is not feasible. Charges for hay will be in accordance with Schedule of Rates (Exhibit 3-D).

Grazing, in a like manner of haying, will be incorporated in a cooperative farming agreement when practical. However, in certain cases, cash permits are the most feasible. Charges for grazing are in accordance with the Schedule of Rates (Exhibit 3-D). Improved pastures are areas containing a well established sod of desirable grasses and/or legumes and water available in ample amounts. Unimproved pastures are areas that are reverting to pine, hardwood, sedge, briers, etc. Water may or may not be available in ample amounts.

Fields 1 through 23, Compartment 9; 1, 2, 3, Compartment 10; 3 and 4, Compartment 22 and 10, Compartment 23 are designated as pasture units. However, these same units may be cooperatively or refuge farmed, and other areas on the refuge may be grazed under Special Use Permit or Cooperative Farming Agreements. The allowable head on areas pastured will not exceed 4 AUMs per acre per year unless specifically justified by the refuge officer in charge.

To summarize, haying and grazing hold low priority in land use management on Noxubee and such practices will be permitted only as a means of carrying out soil conservation practices and in the managing of sodded areas for wildlife.

### 314. Timberlands

314.1 Objectives. It is the objective to manage intensively the forest resource on a sustained yield basis. Silvicultural practices are to be applied and modified toward meeting multi-use objectives with special emphasis on waterfowl management where applicable. All species of wildlife throughout refuge forests will receive proper consideration; however, optimum conditions appear to prevail when emphasis is placed on maintaining desirable habitat conditions for wild turkey and deer.

The first and foremost objective is to create and maintain optimum wildlife habitat conditions for wildlife through sound forest management principles. Special management emphasis is placed on waterfowl habitat, and other forest lands which have no waterfowl potential will be managed for wild turkey, deer, squirrel, dove, quail and many other species.

Sound forest management principles are generally recognized as possessing most of the essential requirements for good wildlife management. Through experience and observations, Branch personnel recognize the need for wildlife modifications within sound forest management principles. Some of these modifications are listed as follows and the management plan is woven around these important wildlife considerations: long rotations (80 to 100 years) instead of shorter ones; even-age stands in management units of 10 acres to a few hundred in size; proper distribution of management units relative to age classes, densities and species composition; proper correlation of suitable ground cover, forest understory, and crown overstory; and proper distribution of open land (approximately 5% of total forest area). Although these modifications are considered as a necessity to wildlife management requirements, they are not always a necessity or requirement to sound forest management principles.

A variety of forestry timber types and vegetative cover types are present on the refuge. Present conditions constitute excellent wildlife management possibilities. In order to enhance wildlife benefits and maintain up-to-date analyses of management needs, annual prescriptions will be required just prior to timber harvest operations.

It is not anticipated that there will ever exist a shortage of den trees, mast producing trees, or understory plants within the hardwood timber types; however, planned cutting practices and prescription work, by trained foresters, contain adequate safeguards to assure the retention of these conditions.

Hardwoods in clumps or in individual trees are to be retained throughout the pine type, both in the under and overstory. The amount to be reserved will vary, depending on the distribution of pine lands in relation to the adjacent timber types.

Management recommendations set forth in this plan, once applied in the field, will produce optimum wildlife populations; and forestry goals will approach optimum conditions. The forestry staff will continue to strive toward improved methods of coordinating forestry and wildlife management activities. The value of this coordinated program will not be curtailed within refuge boundaries. Other Government agencies, private industry and individuals throughout the Southeast are, and will continue to be, interested in the refuge forest wildlife management program. We can only influence wildlife management practices on other lands through a balanced management program. Extreme considerations for wildlife without sound forestry principles will be of little influence. Therefore, while recommendations in this plan favor and assure that favorable wildlife habitat conditions will prevail, they also provide for sound forest management practices.

314.2 General Description and History. Total refuge land comprises approximately 44,778 acres. Of this, 39,899 acres are forest land or 89.1 percent. A variety of timber types and conditions are present within the refuge boundaries, and vegetative cover representative of the Southern, Appalachian and the Delta regions are present. This assortment of forest types creates a favorable environment for managing various wildlife species.

The dominant forest types are pine, pine-hardwood, upland hardwood, bottom land hardwood and cypress. These types are found on sites typical of their requirements and are variable in composition, stocking and quality. Since Noxubee soils are very desirable for timber production, dominant tree heights range from 50 to 120 feet, depending on soil characteristics and drainage. A site index of 85 is considered an average for refuge forest.

Both wildlife and timber potentials are great throughout the various types. Waterfowl potential appears limited to the bottom hardwood forest and open land, while other species of wildlife utilize almost all forest cover types.

Demand for timber is heavy and outlets are numerous in north central Mississippi. Although lumber and pulpwood industries provide the principal markets, there also are local demands for other forest products, such as poles, veneer, handlestock, post, fuelwood, etc.

Following acquisition of the refuge in 1939, little management was practiced prior to the preparation of a timber management plan in 1954, which then provided for a systematic harvest program. During the eight-year period following 1954, approximately 18,102,058 board feet, or 47 percent, of the estimated annual cut was harvested from 16,488 acres, bringing \$495,905.95. These figures amounted to an annual cut of 2,262,757 board feet on 2,061 acres, bringing \$61,988.24 per year. The amount of money received annually for each acre cut was \$30.00, or \$1.38 per acre for all refuge land. These figures do not include 3,684,430 board feet cut for land exchange, or 186,247 board feet cut for county bridges.

Past timber harvest operations have improved the quality of both timber and habitat. However, in lieu of other management practices such as prescribed burning and T.S.I. measures, many of the advantages following harvest operations have been offset. Past funds for timber management purposes have been rather limited. Thus, prescribed burning, T.S.I. practices, access road construction and other needed practices also have been limited.

Noxubee Refuge contains approximately 190,796,700 board feet of sawtimber and 92,550 cords of merchantable pulpwood, or an average of 5,100 b.f. per acre and 2.5 cords per acre, plus a considerable volume of cull and unmerchantable wood. Annual growth is estimated at 5%. The cut and leave cruise system gives an estimated harvest of approximately 8,000,000 b.f. and 2,000 cords annually. Emphasis is placed on the need for on-the-ground management. Timber stands will receive improvement harvest as needed and where stand conversions are necessary, proper cuts will be made, regardless of the volume harvested.

314.3 Management Units. The refuge is separated into 28 timber compartments, ranging in sizes from 683 to 3,954 acres, with the average at 1,599 acres. Division of compartments is based on natural features of permanent nature rather than allocations of volumes and acreages. Roads, creeks, trails and exterior refuge property markers serve as compartment boundaries. Compartment numbers are painted on all entrance points for easy field identification. (Exhibit 3-F, Timber Compartments and Schedule of Cutting)

Timber management will be regulated by compartments. All activities, such as sales, timber stand improvements, prescribed burnings, records, and correspondence, are to be planned and operated on a compartment basis.

Present compartment boundaries will remain until the timber resource approaches a normal forest. Volumes and acreages by this system can be regulated to approach a sustained yield basis during the interim management stage.

Each compartment is mapped by use of aerial photographs and stereoscope. (Exhibit 3-G, Types and Acreage by Compartments; Exhibit 3-A, Land Use Map). Forestry practices are prescribed to fit individual timber types with stand conditions (types) serving as small management units within compartments. There are 53 different cover types on the refuge, Table 1 gives the breakdown of major types by number of cover types, acreage, and percentage of refuge land. Because these types change with management and time, they are only temporary. More than likely, many of these will not be recognizable after silvicultural treatment. Thus, types as management units will be constantly changing in size, but compartments will remain the same.

TABLE I - CLASSIFICATION OF REFUGE LAND

	COVER TYPES	ACREAGE	PERCENTAGE
FOREST LAND TOTALS	46	39,899	89.1
MERCHANTABLE FOREST LAND			
Pine	9	9,298	20.7
Pine-hardwood	9	13,834	30.0
Bottom land hardwood	6	11,181	24.9
Upland hardwood	4	2,967	6.7
Cypress	3	129	.3
SUB-TOTAL	31	37,409	83.5
NON-MERCHANTABLE FOREST LAND			
Pine	2	134	.3
Pine-hardwood	2	398	.9
Bottom land hardwood	5	1,206	2.7
Upland hardwood	4	659	1.5
Pine plantation	1	93	.3
SUB-TOTAL	14	2,490	5.6
NON-FOREST LAND TOTALS	7	4,879	10.9
Field, Permanent	1	1,030	2.3
Field, Grassland	1	1,332	3.0
Field, Rotation	1	1,128	2.5
Bluff Lake (Open Water)	1	709	1.6
Marshland	1	502	1.1
Water	1	149	.3
Recreation Area	1	29	.1
TOTAL	7	4,879	10.9
ALL LAND	53	44,778	100.0

314.4 The Forest Resource. The data on forest acreage and timber volume were secured by a systematic sampling method involving cover type classification on aerial photographs and on-the-ground measurement of trees at sample points. Statistical analysis of the data was not made but sampling error is well below the accepted 10 percent level. Merchantable volumes are given by International  $\frac{1}{4}$  inch rule for board feet of sawtimber, and rough cords (128 cubic feet) for pulpwood.

Noxubee National Wildlife Refuge has 190,796,700 board feet of sawtimber and 92,550 cords of pulpwood of merchantable timber. This volume is concentrated on 37,409 acres of forest land and includes all cover types. Combining both volumes, the refuge has 34,885,000 cubic feet of salable wood which is estimated to be worth \$4,500,000.00. (Exhibit 3-H, Timber Volume by Species and Acreage and Volume by Types.)

These volumes indicate that refuge land contains a fair stocking of merchantable trees. However, volume and stand composition will improve through intensive management practices. Compared with average stocking of sawtimber for Mississippi, refuge volumes are from three to four times greater than those for the State. Average volume per acre is 5,100 board feet, while the Mississippi average is 1,486 board feet; average total merchantable volume per acre is 925 cubic feet and the State average is 441 cubic feet; average basal area is 53.5 square feet and the State average is 37.5 square feet. Approximately one-quarter of the average volume per acre is in high quality trees.

Thirty species of trees account for the volume. Pine is the major economic producer with 51.4 percent of the total merchantable volume (cubic feet) and sweet gum is second with 11.0 percent. However, when all species of oak are combined, their contribution is 26.6 percent of the total merchantable volume. When pulpwood volume is not considered, the percentages are changed somewhat. Only three species were considered under present market conditions as having potential value in pulp sales: pine, sweet gum and ash. The following list gives percentages by total merchantable volume and sawtimber volume by species:

	Percent by Total Merchantable Volume (cubic feet)	Percent by Sawtimber Volume (board feet)
Pine - - - - -	51.40 - - - - -	44.50
Oaks (all species) *	26.63 - - - - -	30.81
Red Oaks - - - - -	(15.72) - - - - -	(18.55)
White Oaks - - - - -	(10.91) - - - - -	(12.26)
Sweet gum - - - - -	11.00 - - - - -	13.00
Hickory - - - - -	5.40 - - - - -	6.25
Black gum - - - - -	1.30 - - - - -	1.54
Cypress - - - - -	1.20 - - - - -	1.40
Others - - - - -	4.05 - - - - -	2.35

\* Oak species in order of prominence are cherrybark, post, southern red, water, overcup and nuttall.

Both pine and hardwood sawtimber were tallied by log grades in the inventory. These grades take into account the diameter, length and amount of defects in individual trees. Grade 2 is considered as high-quality trees which are in demand by most markets. The refuge has 51,472,400 board feet in grade 2, or better trees, for a 27 percent of the total sawtimber volume. The rest are grade 3 trees. Six major species account for 88.5 percent of this high-quality sawtimber. Pine is the major contributor with 34.7 percent, and cherrybark oak is second with 20.5 percent. When grade 3 is considered, pine increases in percentage while hardwoods decrease. This is only natural since pine contributes more volume than the others. The following list gives the percentages of grade 2 and grade 3 sawtimber by species:

	<u>Percent Grade 2</u>	<u>Percent Grade 3</u>
Pine	34.7	47.8
Cherrybark Oak	20.5	16.8
Sweet gum	18.0	9.8
Cow Oak	6.1	2.6
Nuttall Oak	5.2	1.6
Hickory	4.0	7.2
Others	11.5	14.2

Volume by broad forest types gives a different impression of refuge timber. Bottom land hardwood, not pine, is the dominant type. This type has 40.0 percent of the total sawtimber volume (board feet) and pine 20.0 percent. However, when total merchantable volume (cubic feet) is considered, these percentages change slightly in favor of pine. The following list gives the volumes, acreage, and percentages by broad types:

	<u>Acres</u>	<u>Percent</u>	<u>Sawtimber</u>		<u>Per-</u> <u>cent</u>	<u>Total</u>	
			<u>Volume</u> <u>Thd. Bd.Ft.</u>	<u>Bd.Ft.</u>		<u>Volume</u> <u>Thd. Cu.Ft.</u>	<u>Per-</u> <u>cent</u>
Pine	9,432	23.3	30,063.9		20.0	11,223.0	32.2
Pine-hardwood	14,232	35.6	43,331.5		22.7	8,073.0	23.2
Bottom land hardwood	12,387	31.0	95,340.5		49.9	13,417.0	38.4
Upland hardwood	3,626	9.8	12,200.2		6.4	1,891.0	5.4
Cypress	129	.3	1,860.6		1.0	281.0	.8
TOTAL	39,899	100.0	190,796.7		100.0	34,885.0	100.0

Quality of timber is pinpointed when types are emphasized. Bottom land hardwood types contain 72.2 percent of the 51,472,400 board feet in grade 2 trees. Pine types have only 6.5 percent. When grade 3 is considered, bottom land hardwood still leads but pine makes a tremendous increase. The following list gives the volumes and percentages by grade for broad types:

	<u>GRADE 2</u>		<u>GRADE 3</u>	
	<u>Volumes (Bd.Ft.)</u>	<u>Percent</u>	<u>Volumes (Bd.Ft.)</u>	<u>Percent</u>
Pine	3,370,100	6.5	34,693,800	24.8
Pine-hardwood	8,845,900	17.5	34,485,600	24.7
Bottom land hardwood	37,379,000	72.2	57,961,500	41.5
Upland hardwood	1,552,400	3.5	10,647,800	7.2
Cypress	325,000	.6	1,535,600	1.8
TOTAL	51,472,400	100.0	139,324,300	100.0

Growth was measured on 426 trees of different species. It was calculated on basal area increase, which gives a conservative simple interest estimate of volume growth. Average growth for the refuge is approximately 5 percent. At this percent, thirty-four million cubic feet of merchantable wood will give 43 cubic feet or 0.6 cord per acre per year, and 190 million board feet of sawtimber will give 165 board feet per acre per year. Both figures are above the State average of 35 cubic feet and 124 board feet, respectively.

Total sawtimber growth per year is 6,927,313 board feet and total pulpwood growth per year is 8,607 cords. These estimates are based on the following growth percentages:

Pine sawtimber	- 4.1 percent
Cypress sawtimber	- 1.5 percent
Hardwood sawtimber	- 3.3 percent
Total sawtimber	- 3.4 percent
Pulpwood	- 9.3 percent
Total refuge	- 4.9 percent

Mortality by insects, diseases, fires and other natural causes was not sampled and is not deducted from the estimates. However, mortality is equivalent to slightly over 10 percent of the annual volume growth.

Cull in standing trees was not evaluated in the inventory. Generally, 10 percent of the volume may be reduced for defects and cull when it is necessary to account for them. For more accurate results, the following percentages should be used: 3 percent for pine and cypress; 5 percent for pine-hardwood; 12 percent for bottom land hardwood; and 15 percent for upland hardwood.

Cull trees were tallied by basal area. The refuge average is 10.3 square feet per acre. This figure is slightly less than the State average of 12.2 square feet. Estimates of timber stand improvement work (TSI) can be based on the average basal area by types: 3.52 square feet for pine; 19.85 for pine-hardwood; 5.95 for bottom land hardwood; 6.24 for upland hardwood; and 0.21 for cypress.

Current annual growth of forage and browse was estimated by the Campbell and Cassedy method. Pine-hardwood and pine types are the best forage producers, while all types are contributors to browse. Average production per acre for forest land are 86 pounds of forage and 216 pounds of browse. The animal carrying capacities of each type can be estimated from the following list of pounds per acre of forage and browse:

	<u>Pounds per Acre</u>	
	<u>Forage</u>	<u>Browse</u>
Pine	126	216
Pine-hardwood	135	245
Bottom land hardwood	12	151
Upland hardwood	15	268
Cypress	13	97

314.5 Silvicultural Methods. Silvicultural practices are designed to develop the described timber conditions into proper regulated stands. The suggested methods are given as flexible guides rather than as rigid cutting policies. A greater variety and more food for game will be made available when the forest resource is farmed with forestry-wildlife techniques. For instance, dense bottom land hardwood gives a park-like appearance. Since the sun cannot penetrate the trees, ground food for deer and small game is limited. If poor trees are cut, their removal immediately will permit others to take their places and allow the sun to stimulate the growth of ground plants while giving the larger trees room for added growth and mass yield. Before each sale, a reconnaissance of the area will be made to analyse the present stage of regeneration and stand

development. Methods of sale and on-the-ground prescriptions will be accomplished before marking the area.

Despite the fact that a number of separate cover-types are identified, the transition between them often is indefinite and their reaction to treatment is so similar that they are grouped together for marking recommendations. The following marking rules are given for pine and cypress, pine-hardwood, and upland and bottom land hardwoods. Stocking is expressed in square feet per acre of basal area rather than number of trees, board feet, or cords.

Pine and Cypress. Pine and cypress comprise 20.9 percent of refuge area, 33 percent of the total merchantable volume, and fair game habitat for deer, turkey, and quail. The objectives are to perpetuate the types on 9,427 acres of land and to grow high-quality trees for poles and lumber.

The first considerations are to remove the defective and low-quality trees and to open up dense stands. The second is to harvest mature saw-log trees. These combined objectives provide the allowable cut. Two types of cutting will be used: stand improvement cuts and harvest cuts.

Stand Improvement Cuts. These cuts increase growth, develop and maintain high-quality stocking, and scarify the forest floor for invasion of desirable wildlife foods and will be prescribed. This type of cut is used in immature stands of varying densities. A basal area of 75 to 85 square feet per acre should be the minimum stocking left for adequate development. This minimum provides for good growth and maintenance of quality while allowing sufficient light to penetrate the trees for culture of the understory and ground plants. Leave trees should be vigorous, suitable for producing high quality wood, and free of major defects. In reducing the stocking to the desired level, the following marking rules are given in order of importance:

Risk: Trees that will not live until the next cut should be removed. Take out trees with fusiform rust and fire scars when more than one-third of the circumference is affected; lightning-struck trees; and those infected with heart rot.

Form: Take out crooked and leaning trees and those rough and limby. Maintain optimum stocking until a stand decision is made to convert or alter the entire stand. Trees without future quality potential should be removed, provided they interfere with stand objectives and are no longer contributing to desired growth.

Crown Position: Remove trees that interfere with the full development of those with high potential quality, thus providing crown freedom for the better trees. Leave those that serve as pruners when stand conditions need quality development.

Size: Tree diameter should be considered last. Remove smaller sized trees when the other factors are no longer present to consider.

Harvest Cuts. The even-aged silvicultural systems with modifications are to be used. Maturity is a matter of economics and site rather than age. Some trees mature at 20-30 years of age and 6 inches D.B.H., others at 125 or more years of age and 28 inches in diameter. Economic maturity varies with species, markets and tree quality. Generally, the best trees can be considered mature when they are 20 to 24 inches in diameter; on the poorest sites, 6 to 8 inches in diameter may be considered mature.

In stands where adequate reproduction is established, seed trees or group seed-tree harvest cuts may be applied. Leave 4 to 8 trees per acre. Selecting seed trees should be based on the following factors:

Wildlife value: Trees with dens or nests of woodpeckers or squirrels are to be left. The Red-Cockaded Woodpecker is a rare species and his nesting requirements are to be insured. Where other wildlife values are in question, trees are to be left.

Poles: Trees with pole qualifications are to be left for higher economic values in later removal sales. Preferably trees in the mid-pole class with healthy tops should be selected. They will grow into better classes while the reproduction is advancing. Caution should be exercised in leaving high quality or high class pole trees because of possible loss due to lightning.

Fire: In areas of high fire risk, more seed trees than those suggested should be left to insure adequate reseeding in case of fire.

In stands where adequate reproduction is not established, shelterwood and strip or block clear-cut harvest techniques may be applied when timed with seed years for natural regeneration of the type. Advance planning and preparation is the criterion for success in using these methods. Since forest management is in the interim stage of development, these stand treatments should be alternately used in testing the results on wildlife habitat.

A stocking of 35 to 50 square feet of basal area per acre after the initial cut is adequate for the shelterwood method. Seed source and sufficient light for germination are maintained by reducing the stocking to this level. The previous marking rules given for selecting leave trees in the stand improvement cuts should be used in the shelterwood cut.

In using the strip clear-cut technique, the width of the clear-cut strip should not be wider than twice the height of dominant trees in the adjacent seed strip. In the block clear-cut technique, the width of the clear-cut block should not be wider than twice the height of dominant trees in the surrounding seed blocks.

Prescribed burning is used for regulating natural regeneration, both pine and hardwood, until it is needed in the pine types. It is used in understocked stands to reduce competing hardwood saplings and to favor pine reproduction. It is used to reduce fuel accumulation of needle litter to favor vines, legumes, and herbs.

Pine-Hardwood. Pine-hardwood comprises 30.9 percent of refuge area, 23.2 percent of the total merchantable volume and some of the best upland game habitat for deer, turkey and quail. The objective of management is to improve the species composition and stocking on 13,834 acres of land and to grow high-quality trees for lumber and poles. Most pine-hardwood stands contain large numbers of highly defective and poorly formed trees in addition to those of unwanted species. In the initial cut the first consideration is the removal of defective, low-quality trees, undesirable species, and mature trees. This objective provides the allowable cut. One type of cutting will be used: stand improvement cuts.

Stand Improvement Cuts. Cuts which favor certain species, increase growth, develop and maintain high-quality stocking and scarify the forest floor for invasion of desirable wildlife food, will be prescribed. This type of cut is used in all stand conditions under management. It provides a way in which a stand of high-quality trees is developed and maintained by removing the poor trees over the entire range of size classes, and by removing mature and overmature trees through partial cuts made at ten-year intervals. A basal area of 75 to 85 square feet per acre of the desired species should be the minimum stocking left for adequate development. This minimum allows for good growth and maintenance of quality while permitting sufficient light to penetrate the trees for culture of the understory and ground plants.

Timber marking by this technique is based on individual tree characteristics. Leave trees should be vigorous, suitable for producing high-quality wood and mast, and free of major defects. In reducing the stocking to the desired level, the following marking rules are given in order of importance:

Risk: Trees that will not live until the next cut should be removed. Take out lightning-struck trees, root-sprung trees, and trees with fusiform rust and fire scars when more than one-third of the circumference is affected.

Cull: Cull or highly defective trees that will not increase in value during the ten-year cutting period should be removed.

Form: Take out crooked and leaning trees and those rough and limby. Maintain optimum stocking until a stand decision is made to convert or alter the entire stand. Trees without future quality potential should be removed, provided they are interfering with stand objectives and are no longer contributing to desired growth.

Species: Species value is determined by local market conditions, and it is essential that the marker weigh the values of each tree before marking it. Pine, cherrybark oak, shumard oak, southern red oak, white oak, and yellow poplar are the preferred species. Hickory, sweet gum, black gum, ash, and persimmon on the best sites are to be left for specialty sales. Wildlife requirements will be considered prior to commercial aspects.

Crown Position: Remove trees that interfere with the full development of those of high potential quality, thus providing crown freedom for the better trees for growth or mast production. Leave those that serve as pruners when stand conditions need quality development.

Although the object of stand improvement is the same in all instances, application of the marking guides differs depending on whether or not the overstory or understory is deficient in stocking.

Prescribed burning is used when pine is the major species of management and stand conditions are favorable. Discretion in its use is important when the quality of hardwoods is affected. Light burns improve habitat for deer, turkey and quail.

Timber stand improvement is an important technique that can be used widely in reducing the growing space occupied by cull trees wherever they are interfering with thrifty timber. It should immediately follow the cutting operation. When market conditions do not allow cutting of some trees selected under the marking rules, they should be removed during the TSI program.

Upland Hardwood and Bottom land Hardwood. Upland hardwood comprises 0.7 percent of refuge area and 5.4 percent of the total merchantable volume. Bottom land hardwood comprises 24.9 percent of refuge area

and 38.4 percent of the total merchantable volume. Combined, they have a total of 14,148 acres which is some of the best wildlife habitat in the region for squirrels, deer and ducks. The objective of management is to perpetuate the types on this acreage, to improve the species composition and stocking for wildlife benefits, and to grow high quality trees for lumber and special products. Most hardwood stand conditions contain large numbers of highly defective and poorly formed trees in addition to those of unwanted species. In the initial cut the first consideration is the removal of defective, low-quality trees, undesirable species, and mature trees. This objective provides the allowable cut. Two types of cutting will be used: stand improvement cuts and harvest cuts.

Stand Improvement Cuts. Stand improvement cut basically is a selection method of cutting with certain modifications of the all-aged management system. Cuts which favor certain species, increase growth, develop and maintain high-quality stocking and scarify the forest floor for invasion of desirable wildlife food, will be prescribed. This type of cut is used in all stand conditions under management: immature, mature and overmature. It provides a way in which a stand of high-quality trees is developed and maintained by removing the poor trees over the entire range of size classes, and by removing the mature and overmature trees through a series of partial cuts made at ten-year intervals. This type of management will be used widely in development of oak mast in the green tree reservoir system.

A basal area of 75 to 85 square feet per acre of the desired species should be the minimum stocking left for adequate development. This minimum allows for good growth and maintenance of quality while permitting sufficient light to penetrate the trees for culture of the understory and ground plants. However, as the size of trees decreases, the amount of residual basal area should be increased. Because the smaller the trees, the more likely they are to develop epicormic sprouts, stump sprouts, and root suckers.

Timber marking by this technique is based on individual tree characteristics. Leave trees should be vigorous, suitable for producing high quality wood and mast, and free of major defects. In reducing the stocking to the desired level, the following marking rules are given in order of importance:

Risk: Trees that will not live until the next cut should be removed. Take out root-sprung trees and leaning trees.

Cull: Cull or highly defective trees that will not increase in value during the ten-year period should be removed. Take out lightning-struck and badly fire-scarred trees.

Form: Take out crooked, rough, forked or limby trees. Remove any tree that will not ever produce high quality lumber or special products.

Species: Low-quality timber has about the same value regardless of species. But large value differences exist between species when quality is high. Species value is determined by local and area-wide market conditions; and it is essential that the marker weigh the values of each tree before marking it. Favor cherrybark oak, shumard oak, cow oak, yellow poplar and sweet gum on fronts and ridges; nuttall oak, water oak, willow oak, cow oak, sweet gum, black gum and ashes on flats and slashes; and sweet gum, cypress, and tupelo gum in sloughs. Hickory, beech, sycamore, ash, and persimmon on favorable sites are to be left for specialty sales.

Crown position: Remove trees that interfere with the full development of those of high quality, thus providing crown freedom for the better trees for growth or mast production.

Size: Tree diameter should be considered last. Economic maturity varies with species, markets, and tree quality. Generally, most species become mature when they reach 20 to 24 inches in diameter.

Harvest Cuts. Cuts of the all-aged silvicultural system are to be used in mature and over-mature stands. The group-selection methods which create small openings (about 1/5 acre) throughout the stand by a series of partial cuts at ten-year intervals are prescribed for species which are intolerant of shade. These small patches will greatly benefit deer in dense over-mature stands which are park-like in appearance. This is recommended for dense stands of sweet gum and red oaks, especially nuttall, willow, and water oaks, which contain high-quality wood and are very susceptible to degrading by heavy epicormic sprouting. Before using this treatment some type of control might be necessary to remove weed species in the ground cover, such as ironwood, beech and hornbeam. If so, use the chemical technique recommended by the timber stand improvement section of this plan.

Timber stand improvement is an important technique that can be used widely in reducing the growing space occupied by cull trees wherever they are interfering with thrifty timber. It should follow immediately the cutting operation. When market conditions do not allow certain trees to be selected for cutting

under the marking rules, such trees should be removed during the TSI program.

### Special Techniques

Prescribed Burning: Prescribed burning as a silvicultural tool in the pine and pine-hardwood types can be practiced beneficially in order to increase turkey and deer ranges, reduce dangerous accumulations of fuel, aid natural regeneration, and control undesirable hardwoods on valuable forest land.

Approximately 20,000 acres of refuge land can be burned effectively on a four-year basis. However, since the final determination of burning conditions will be made in the field after burning areas are selected in the office, a set schedule of burning will not be followed. Some types will be burned more often than others and no difficulty should be encountered in sites for this practice. The cover-type map will help to locate these areas by compartments.

Burning preferably will take place in late October and proceed through March, although burning can be done at any time except during nesting season. Although the areas scheduled for burning should be broken into blocks of 50 to 100 acres, smaller areas may be burned when sites selected contain less acreage. Fresh fire lines will be plowed before each burn and a fire tractor and three men will be located at the area at all times. While the remainder of personnel will be on emergency standby, the Mississippi Forestry Commission and adjacent landowners, especially Mississippi State University, should be notified.

Cost data, burning conditions, burning results and areas burned will be recorded immediately after each burn by the person in charge.

Timber Stand Improvement (TSI) is an important tool that can be used extensively in all types in improving the health of the forest resource. Cull trees interfering with thrifty timber are to be removed unless the wildlife value of such trees requires that they be left.

TSI should follow immediately after an area has been cut. Bottom land hardwood, upland hardwood, pine-hardwood and pine, in that order, are scheduled for TSI with chemical treatments

(poison and tree injectors) recommended over mechanical methods (axes or little beaver) except on larger trees. Where areas are open to hunting, chemical treatment is preferable. Areas will be selected on recommendations of field prescriptions made during the marking job. The average per acre volume tables will aid in determining the work estimates and cost. Cost data, work requirements, and tree removal data will be recorded immediately after each job by the person in charge.

Regeneration, natural and artificial, will be used in establishing reproduction. Natural regeneration is obtained by using silvicultural methods with seed crop years and artificial regeneration is used when natural regeneration will not establish the desired reproduction.

Both hand planting and direct seeding may be used in establishing reproduction. Planting areas will be determined during late summer so that orders for seedlings can be placed by fall. Cost data, work requirements, and acreage planted will be recorded immediately after the work is completed by the person in charge.

Cutting Capacities and Budget. The key to forest management is good cutting practices. During the ten-year period, the exact amount cut each year will not be extremely important. The allowable cut is determined by the objectives of each silvicultural system. It is here that the importance of the marking rules is stressed if the area is to be left in the best possible condition.

During the ten-year period the cut is designed to improve the growth and quality of the stocking. An annual cut of 8,271,450 board feet and 2,402 cords is indicated by the "cut" tallies of the inventory. The tallies demonstrate that, in bringing the stands up to the best silvicultural conditions, this amount should be cut. However, growth data indicate that 6,927,313 board feet and 8,607 cords will be grown during the period. Since the growth volume is considered low and the two figures are relatively close, on-the-ground "cut" volumes will be taken as the allowable cut in fulfilling the objectives of this plan.

Compartment scheduling will follow the same pattern as the two previous management plans. Compartment numbers have changed but the general cutting sequence will be similar. Ten groups of compartments, scattered over the refuge, have been so arranged that the whole refuge will be cut over in the ten-year period. These are presented in Table II and Table III.

TABLE II - COMPARTMENT ARRANGEMENT BY GROUPS

<u>YEAR</u>	<u>COMPARTMENTS</u>	<u>NET ACRES</u>	<u>MERCHANTABLE ACRES</u>
1962	6	1,016	864
	16	1,767	1,323
	28	871	845
		<u>3,654</u>	<u>3,032</u>
1963	2	1,162	1,120
	12	1,317	1,142
	26	1,470	1,372
		<u>3,949</u>	<u>3,634</u>
1964	13	1,664	1,620
	20	1,610	1,463
	24	735	663
		<u>4,009</u>	<u>3,746</u>
1965	5	1,578	1,503
	21	1,222	1,061
	27	1,637	1,447
		<u>4,437</u>	<u>4,011</u>
1966	10	1,506	1,184
	17	2,304	2,166
	25	1,544	1,517
		<u>5,354</u>	<u>4,867</u>
5-year sub-total - - - - -		21,403 - - - - -	19,290
1967	1	890	828
	19	1,807	1,301
	22	1,461	1,304
		<u>4,158</u>	<u>3,433</u>
1968	8	2,855	1,178
	18	1,454	1,660
		<u>4,309</u>	<u>2,838</u>
1969	3	683	675
	23	3,954	2,495
		<u>4,637</u>	<u>3,170</u>
1970	4	1,171	1,152
	11	1,275	1,256
	15	1,110	1,003
		<u>3,556</u>	<u>3,411</u>

<u>YEAR</u>	<u>COMPARTMENTS</u>	<u>NET ACRES</u>	<u>MERCHANTABLE ACRES</u>
1971	7	1,884	1,579
	9	2,750	2,251
	14	2,081	1,437
		<u>6,715</u>	<u>5,267</u>

10-year total - - - - - 44,778 - - - - - 37,409

TABLE III - COMPARTMENT ARRANGEMENT BY YEARS

<u>COMPARTMENT</u>	<u>YEAR</u>	<u>NET ACRES</u>	<u>MERCHANTABLE ACRES</u>
1	1967	890	828
2	1963	1,162	1,120
3	1969	683	675
4	1970	1,171	1,152
5	1965	1,578	1,503
6	1962	1,016	864
7	1971	1,884	1,579
8	1968	2,855	1,178
9	1971	2,750	2,251
10	1966	1,506	1,184
11	1970	1,275	1,256
12	1963	1,317	1,142
13	1964	1,664	1,620
14	1971	2,081	1,437
15	1970	1,110	1,003
16	1962	1,767	1,323
17	1966	2,304	2,166
18	1968	1,454	1,660
19	1967	1,807	1,301
20	1964	1,610	1,463
21	1965	1,222	1,061
22	1967	1,461	1,304
23	1969	3,954	2,495
24	1964	735	663
25	1966	1,544	1,517
26	1963	1,470	1,372
27	1965	1,637	1,447
28	1962	<u>871</u>	<u>845</u>
		44,778	37,409

The order in which each compartment is cut will be rigidly controlled, unless otherwise approved by the Regional Office. Once cutting has started in a compartment, it is important to finish the compartment before moving to another. It is imperative that all operable areas be marked when a compartment is entered; otherwise, missed or skipped areas in the merchantable class will not be scheduled for harvest operations until the next cutting cycle. Other phases of silvicultural requirements, such as prescribed burning, may have shorter treatment cycles.

Cutting in compartments is restricted to types having more than 800 board feet or 1 cord per acre of "cut" material. No difficulty should be encountered in locating types where suitable cuts can be made. The average volume per acre tables give the kind and amount of timber which can be cut from a type. The cover-type map will help to locate these areas of cuts within compartments. Consultation of the tables and cover-type maps will provide aid in determining where logging should be done in a compartment, especially when a particular kind of timber is needed. After tentative cutting decisions have been made in the office, the final determination should be made in the field.

The highest priority should be given to the salvage of timber that has been injured or killed by insects, diseases, fires or some other cause.

The annual allowable cut is 8,271,450 board feet of sawtimber and 2,462 cords of pulpwood. If a heavier cut is made for any one program year, no harm will be done, provided the refuge does not cut more than a total of 82,714,500 board feet and 24,620 cords by 1972.

The allowable cut for the ten-year period by species and grade is:

<u>SPECIES</u>	<u>ALLOWABLE CUT</u>	<u>GRADE 2</u>	<u>PULP</u>
	<u>Board Feet</u>	<u>Board Feet</u>	<u>Cords</u>
Pine	27,659,700	7,782,200	23,380
Cypress	868,100	146,800	-
Sweet gum	15,101,800	6,098,500	1,250
Other hardwood	<u>39,084,900</u>	<u>7,045,100</u>	<u>-</u>
	82,714,500	21,072,600	24,620

The allowable cut for the ten-year period by major type and grade is:

TYPE	ALLOWABLE CUT	GRADE 2	PULP
	Board Feet	Board Feet	Cords
Pine	7,655,600	1,204,500	18,420
Pine-hardwood	18,942,800	2,625,000	5,680
Bottom land hardwood	52,970,400	17,164,400	500
Upland hardwood	2,802,000	73,900	20
Cypress	343,700	4,800	-
	82,714,500	21,072,600	24,620

314.6 Timber Markets and Methods of Sale. Marketing and silvicultural practices are interwoven and end results are measured largely by how well the two are correlated.

Forest industries annually cut approximately 54.2 million board feet of sawtimber and provide over half of the industrial jobs in the surrounding area. The latest U.S. Forest Service Survey of Mississippi indicates that the three-county area (Noxubee, Oktibbeha and Winston Counties) supports 2 large sawmills, 22 small sawmills, 1 veneer plant, 1 wood-preserving plant, 1 handle-stock plant, and 10 pulpwood concentration yards. All of these are major consumers of refuge stumpage. However, many plants outside this perimeter purchase stumpage when quality or specialty sales are offered.

Timber management plans indicate that 82,714,500 board feet and 24,620 cords will be sold during the period 1961-1971. If this volume is marketed, the refuge will gross approximately \$1,740,930, or \$45.80 per acre of refuge land. Figured on the estimated \$4,500,000 value of timber (average \$100 per acre), the harvest of wood will yield 38.7 percent return over the period of ten years. In addition to these returns, primary objectives will be realized through improved wildlife habitat, increased quantity and improved quality of the forest inventory.

All regulations governing sales in the Wildlife Refuge Manual (Sections 3413-3416) will be observed. The following procedure will govern the handling of timber sales by Special Use Permit Form 3-1783 and Permit Form 3-1400.

Special Use Permit Form 3-1383 is used where fees are charged for the removal of refuge products. Open market sales, informal bid and formal bid solicitations may be used for establishing market value and sale rates. This form is used for soliciting large sales, small sales, informal small sales, and special sales. Timber sales of approximately 500,000 board feet for sawtimber or 1,500 cords for pulpwood appear to be near the maximum limits at the present time;

however, size of sales may be subject to change to meet local demands. These limits, which give an unsuccessful bidder more chances for sales, are intended to increase the number of sales in a given year; to increase the likelihood of all sales being cut within a 12-month period; and to allow sales to fluctuate with rising or falling markets. Standing tree volume tables will be used for all sales except in conditions where log scale is requested or desired.

Bids will be solicited on all large sales (\$500.00 and over), and an effort will be exerted to secure two or more bids. Timber will be marked by the prescribed marking rules and the International  $\frac{1}{4}$ -inch log rule and standard rough cords (128 cubic feet) will be used in making volume measurements for refuge records. Other volume rules may be used for bid solicitations. Invitations will be sent to all interested parties.

Specific dates, both for prospective buyers wishing to inspect the sale area and for opening bids will be announced in the invitation, these being not less than a week apart. The size of the sale will determine whether the payment will be a lump sum or advance deposits. Tree tallies, volumes, logging conditions and restrictions will be explained and transportation made available as sales are displayed. All bids are to be opened in the presence of bidders at the time set in the invitation. Sales will be awarded to the firms whose bids are calculated to be the best for all existing conditions. Bids received after the time deadline will not be considered and new bids will be solicited in the event of a tie bid. Each bidder will be required to submit with his bid a deposit in the amount of \$500, payable to the Bureau of Sport Fisheries and Wildlife, in the form of a bank draft or certified check. The deposit of the successful bidder will be retained by the Government as a performance guarantee to cover any damages or claims the Government may have against the permittee as a result of his operations under the terms and conditions of the permit-agreement. The balance, if any, is to be returned to the permittee upon satisfactory completion of the operation. Deposits of the unsuccessful bidders will be returned after a determination has been made regarding the contractor who will be awarded the permit.

All bids, the application for special use permit (Form 3-1387), and the guarantee deposit will be forwarded to the Regional Office. Permittees may start operations as soon as Special Use Permit Form 3-1383 has been executed.

Permittees are responsible for carrying out provisions of the permit-agreement regardless of sub-contractors or agreements with other persons. Periodic inspections for damages will be made by refuge foresters and a final inspection will be made with the operator before the guarantee deposit is returned. The full guarantee will

remain with the Government until the end of the operation and no stumpage will be paid from this deposit. A penalty will be deducted from the deposit according to appraised damages to roads, bridges, telephone lines, fences, other improvements, fires started by the operation, unnecessary damage to standing timber, and cutting of unmarked trees. Timber operations may be stopped when high stumps, poor timber utilization, excessive damage to standing timber, and cutting of unmarked trees are observed. Reports of these inspections will be filled out and kept in the sale folders.

Periodic inspections determining amounts of cut in sales where advance payments are allowed will be made by refuge foresters and operators. Designated areas by volumes and natural boundaries set before the permittee starts cutting will govern the payments. When payments are not met by the permittee, operations will be stopped and guarantee deposits forfeited.

Commercial timber sales of less than \$500.00 are discouraged on an economic basis; however, salvage sales may be necessary, and should be handled in a similar manner as sales exceeding the \$500.00 limitation. At least two bids will be received and forwarded to the Regional Office attached to the special use permit signed by the Refuge officer-in-charge.

Non-commercial sales such as fuel wood and miscellaneous uses will not require bid solicitations.

All commercial sales other than salvage sales resulting from storm, fire, beaver damage, insect damage, flooding, etc., will be restricted to those compartments scheduled for annual operations at the time these sales are made.

Sales to county governments and schools are considered as nonprofit marketing. Special considerations will be given to each request and charges will be established by the Regional Director.

#### 314.7 Protection.

Fire: There has been considerable fluctuation from year to year in the number of fires and acreage lost since the beginning of fire protection. Sales and stand improvement programs are rapidly increasing the fire hazard, and the possibility of a blow-up is ever present. Since there are many acres of refuge land on which timber values alone exceed \$300.00 per acre, good fire protection is essential. Fire prevention, presuppression, and suppression on forest lands are discussed in a subsequent section, 332.

Insects and Disease: Control of insects and diseases can never be fully achieved. However, management recommendations in the timber management plan are designed for maintaining an optimum stocked and vigorous forest. This in itself will be the primary control measure. Personnel working with the forest management program must continue to make day-to-day observations for insect outbreaks in order that losses may be held to a minimum.

Storm and Beaver Damage: Nearly every year, winds reaching high velocities affect the refuge. Areas where storm damage occurs should be investigated and sales initiated at the earliest possible time to salvage the down timber. If damage is confined to small acres involving less than \$500 worth of timber, sales should be made immediately by the refuge manager. Where damage is more extensive, competitive bids are required.

Beavers are numerous over the refuge. They cut standing trees and flood low areas which contain heavy volumes of bottom land hardwood. The sale requirements for storm damage applies to salvaging beaver damaged timber.

Trespass: Timber trespass is a difficult problem to handle, especially when it is unintentional. Painting refuge property lines and re-establishing corners will discourage trespassing. When trespass occurs, the incident should be investigated and a full report indicating the location, extent of trespass, estimated damage, and other pertinent information explaining the case should be sent to the Regional Office. (Paragraphs 3728-3728c, of the Wildlife Refuge Manual, outline the action to take against trespass.)

Natural Area: Natural areas on National Wildlife Refuges are set aside as permanent inviolate areas. A stand of bald cypress, SAF type 101, has been approved for this purpose in timber Compartment 19. An area of 46 acres in Lot 4, Section 1, Township 16 North, Range 15 East, in Winston County, enclosed by a painted (yellow) boundary, is to be protected in its present natural state. The boundary and entrance points are to be maintained for identification and access.

A bald cypress pond of 38 acres in Pete's Slough (Parker's Slough) south of the Keaton Tower Road has been selected to be a natural area of local importance. Located in the north  $\frac{1}{2}$  of Section 31, Township 17 North, Range 15 East in Oktibbeha County, it can be more accurately located by the cover type map of timber Compartment 23 as type C4F. Although the edge of the type is distinctive enough to serve as a boundary, a painted boundary is preferable.

Dr. S. W. Pearson Tract (1885): The Bureau of Sport Fisheries and Wildlife leased 20 acres in timber Compartment 7 from Dr. S. W. Pearson of Louisville. The area, located in Northwest  $\frac{1}{4}$  of the Northwest  $\frac{1}{4}$  of Section 36, Township 16 North, Range 14 East in Winston County, is to be administered and protected as a part of the refuge. However, Dr. Pearson reserved the rights to timber, oil and gas. The boundary is painted and maintained so that refuge cutting practices will not cross over the line.

314.8 Recreation Area. One area of 29 acres on Bluff Lake and in timber Compartment 14 is set aside for recreation. Limited cutting may be done to maintain the aesthetic value but such cutting is not to be included in the scheduled sales of timber Compartment 14.

314.9 Records and Future Plans. Records of forestry activities will be kept on correspondence, sales, cutting practices, controlled burning, fires, timber stand improvements, regeneration, and research. These are to be posted and kept current by the calendar year.

Correspondence, sales, fire, and research records are kept and filed by year of occurrence. Sales, cutting practices, controlled burning, timber stand improvement, regeneration, and fires are to be posted on compartment maps and entered in compartment records annually. Cut volumes will be entered by products regardless of whether timber was cut under commercial sale, trespass, administrative, or other use. Cost, estimates of work, prospective buyers' list, and other valuable data will be kept and evaluated annually.

The presented plan is designed to fit the needs of the ten-year period of management. However, changes occurring with land acquisition should be added. The new plan for the next period may be delayed if the cutting budget is not completed in ten years. In preparing the plan for 1971, it should be beneficial to recognize the 1,200 man hours of work involved in the present plan.

## TIMBER COMPARTMENTS AND SCHEDULE OF CUTTING

## NOXUBEE NATIONAL WILDLIFE REFUGE

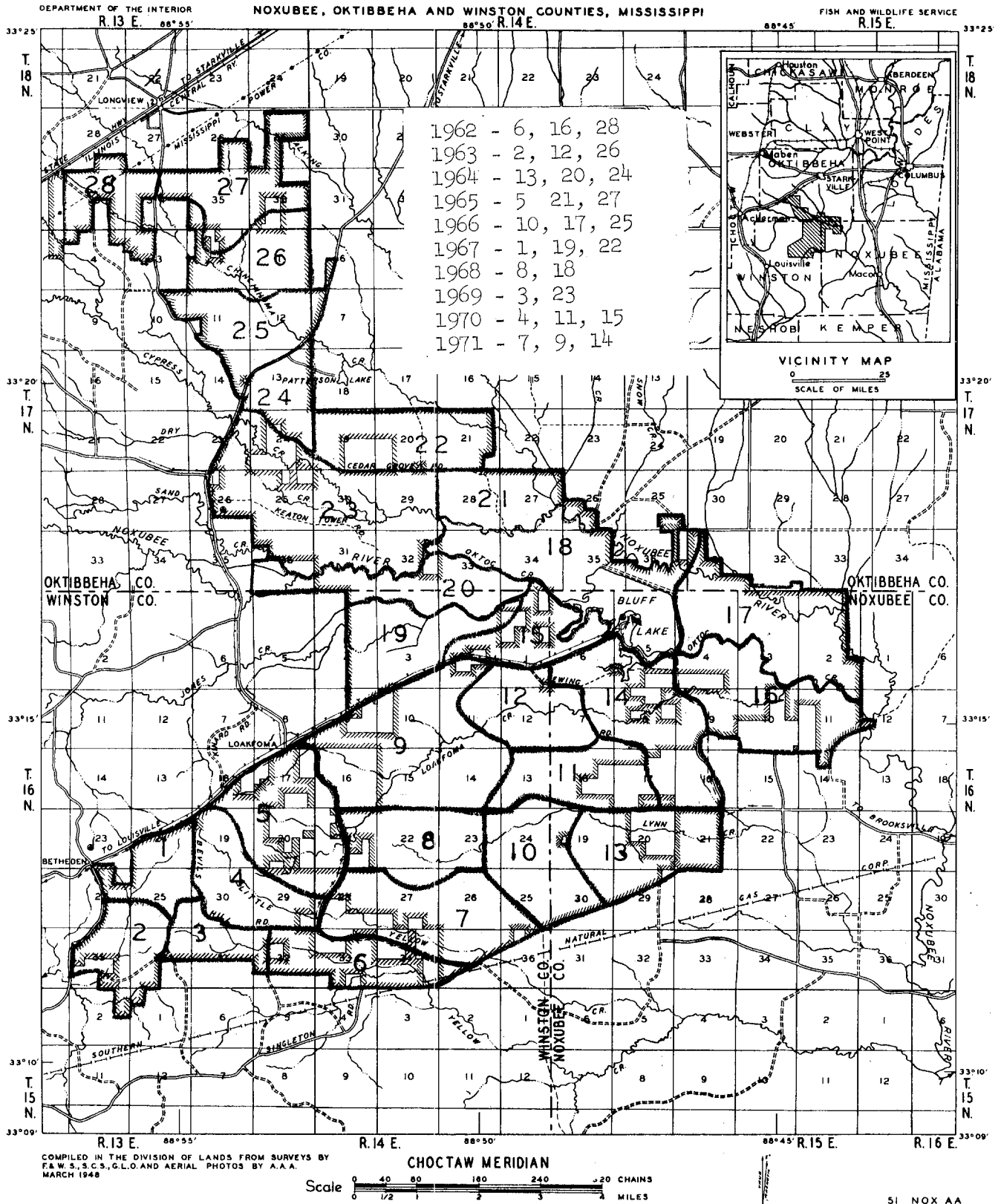


EXHIBIT 3-C  
FOREST TYPES AND ACREAGE BY COMPARTMENTS

TYPES	COMPARTMENTS															COMPARTMENTS										COMPARTMENTS										TOTALS BY TYPES
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28								
P4F		166	63	23		50			20			56				21		6		16				14					435							
P4M	67	57	77	344	130	173	242	89	282	12	50	106		30	118	48	28	34				173	43		23			40	2286							
P4L									25						4							4					14		47							
P3F	130	189	75	65	63	64	146	78	86		145	66	47	61	53	3			37				66	26	66		36	51	1557							
P3M	185	401	18	70	399	47	137	153	167	32		2	14	85	79	4		19	128	15	409	93	76	22	79	138	45		2817							
P3L					15		32								18						89	31							185							
P2F	70	9	10	12	64	10	17		52	31	91		388	118	21	36		29	4		29	143	12	24		107	28	19	1324							
P2M	46	20	48	35			43		38	59		18	38	24	45	7				9	29	98	36	26					613							
P2L		10						7	17																				34							
P1F													6														3		9							
P1M			3		10									24								23					65		125							
P1L																													0							
TOTALS	498	852	294	549	741	344	617	327	681	134	290	248	493	402	338	119	28	88	169	40	556	565	233	112	168	245	191	110	9432							
PH4F		63		44							36			40										48			31		262							
PH4M	185	15	63	221	257	320	541	736	911	711	703	123	1095	289	293			62	204			499	115	487	1330	1093	970	735	11960							
PH4L					19	134				201					19	18						18					229		638							
PH3F														30		97	9												136							
PH3M			5		22		63					11				73	15					20	34				33		276							
PH3L									15													68	20				17		120							
PH2F														26												27			53							
PH2M							10	21								33		25					99	16			44		248							
PH2L														20		13		108											141							
PH1F							139		7														18			16	41		221							
PH1M									32													38	41			57	9		177							
PH1L																													0							
TOTALS	185	78	68	265	279	339	887	757	965	912	739	136	1095	405	312	234	24	62	337			643	327	551	1330	1193	1374	735	14232							
UH4F																													0							
UH4M	130	170	316	338	478	62	151	40	146		116	387		56								14				7			2411							
UH4L						14		54	40	138	111		38																395							
UH3F									29																19				48							
UH3M	15	20			15		63																						113							
UH3L																													0							
UH2F							49	77								31					23		19	7					206							
UH2M								19															66						85							
UH2L																													0							
UH1F						17	10		33	243	5												5	10	7		8		338							
UH1M			3						16														11						30							
UH1L																													0							
TOTALS	145	190	319	338	493	93	273	190	264	381	232	387	38	56		31						23	14	82	29	33	7	8	3626							

EXHIBIT 3-G (CONT'D)  
TYPES AND ACREAGE BY COMPARTMENTS

TOTALS																														
TYPES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	BY TYPES	
BH4F									190					547		38	1544	1381	614	1086	505	85	1611						7601	
BH4M					105				239			352		32	303	617	510	56	33	18			101						2366	
BH4L												19		14	41	139			59	205		58	46						581	
BH3F														5	9	23	52	32	15	74			198						408	
BH3M																75													75	
BH3L																78		41	31										150	
BH2F												91		26	18	32	108	34	29	125	51		341	10					865	
BH2M														3		43							3						49	
BH2L																	4						14						18	
BH1F					12				15										23	15	7	44	139						255	
BH1M																							19						19	
BH1L																													0	
TOTALS					117				444			462		627	371	1045	2218	1544	804	1523	563	187	2472	10					12387	
C4F																	8		21				38						67	
C4L																			22										22	
C3F																				40									40	
TOTALS																	8		43	40			38						129	
MARSH																	21	412	13	7	49								502	
WATER	1			1	1	1			10					1	53	47					3	1	18	5	1	3	1	2	149	
FP	10	42	2	18	54	122	107	91	39			5	8	24	49	4	66		8	65		28	3	164	19	12	22	63	5	1030
FG	48				10			89	347	79	9	25	13	68		154		26				48	416						1332	
FR												51		392	38	96			376				175						1128	
TOTALS	58	42	2	18	64	122	107	180	386	79	14	84	37	509	42	316		34	441		28	51	755	19	12	22	63	5	3490	
REC AREA														29															29	
BLUFF LAKE																													709	
PP	3															22	5	6					29	9				19	93	

GRAND TOTAL 890 1162 683 1171 1578 1016 1884 1454 2750 1506 1275 1317 1664 2081 1110 1767 2304 2855 1807 1610 1222 1461 3954 35 1544 1470 1637 871 44778

EXHIBIT 3-H  
TIMBER VOLUMES BY SPECIES

SPECIES	TOTAL GRADE 2 CUT BD FT	TOTAL GRADE 3 CUT BD FT	TOTAL CUT BD FT	TOTAL GRADE 2 LEAVE BD FT	TOTAL GRADE 3 LEAVE BD FT	TOTAL LEAVE BD FT	TOTAL BOARD FEET	PERCENT BY BOARD FEET	TOTAL PULP CUT CORDS	TOTAL PULP LEAVE CORDS	TOTAL PULP CORDS	TOTAL CU FT VOLUME	PER CENT CU FT
CYPRESS	146800	721300	868100	349600	1458800	1808400	2676500	1.40				427000	1.20
PINES	7782200	19877500	27659700	10007900	46772200	56780100	84439800	44.50	23380	64930	88310	17937000	51.40
ASHES	190000	98800	288800		347400	347400	636200	.30		160	160	106000	.30
BEECH	190000	238300	428300				428300	.02				82000	.24
BLACKGUM	258400	1869200	2127600	258400	544300	802700	2930300	1.54				472000	1.30
BOX-ELDER		322900	322900				322900	.20					
ELMS		979900	979900	6900	555300	562200	1542100	.80				274000	.80
HACKBERRY	190000	581400	771400		36400	36400	807800	.40				161000	.50
HICKORIES	514400	5966000	6480400	1550300	3858000	5408300	11888700	6.25				1889000	5.40
HOLLY					13400	13400	13400	.01					
MAPLES		207100	207100		240500	240500	447600	.20				86000	.25
BLACK OAK					180800	180800	180800	.10				24000	.07
BLACKJACK OAK	1517800	6000	6000				6000	.01					
CHERRYBARK OAK	1517800	1831200	3349000	9013200	5062700	14075900	17424900	9.15				2690000	7.70
COW OAK	2196700	2301200	4497900	1041300	1202200	2243500	6741400	3.52				963000	2.76
N. RED OAK					60300	60300	60300	.01					
NUTTALL OAK	101700	395300	497000	2586200	1658200	4244400	4741400	2.49				679000	1.95
OVERCUP OAK	630900	2201000	2831900	512200	817100	1329300	4161200	2.19				688000	1.98
POST OAK		7781500	7781500	5300	1222300	1227600	9009100	5.00				1524000	4.40
SHUMARD OAK					66500	66500	66500	.01				14000	.07
S. RED OAK	47700	3705200	3752900	233400	1838300	2071700	5824600	3.06				922000	2.66
WATER OAK	336400	1768700	2105100	986500	2146900	3133400	5238500	2.75				849000	2.43
WILLOW OAK		631300	631300		1415400	1415400	2046700	1.06				289000	.84
WHITE OAK	392300	767200	1159500	513800	2134000	2647800	3807300	2.05				612000	1.77
PECANS					113100	113100	113100	.10				24000	.07
PERSIMMON		98800	98800		264400	264400	363200	.20				80000	.23
SWEETGUM	6098500	9003300	15101800	3127400	5345900	8473300	23575100	13.00	1250	2840	4090	3857000	11.00
SYCAMORE	220400	190000	410400				410400	.20				76000	.22
WILLOW					4600	4600	4600	.01				1000	.003
YELLOW-POPLAR	258400	98800	357200	207400	323400	530800	888000	.50				159000	.46
TOTALS	21072600	61641900	82714500	30399800	77682400	108082200	190796700		24620	67930	92560	34885000	

EXHIBIT 3-H (CONT'D)  
TIMBER ACREAGE AND VOLUME BY TYPES

TYPE	ACRE- AGE	TOTAL GRADE 2 CUT BD FT	TOTAL GRADE 3 CUT BD FT	TOTAL CUT BD FT	TOTAL GRADE 2 LEAVE BD FT	TOTAL GRADE 3 LEAVE BD FT	TOTAL LEAVE BD FT	TOTAL BOARD FEET	PER CENT BY BOARD FEET	TOTAL PULP CUT CORDS	TOTAL PULP LEAVE CORDS	TOTAL PULP CORDS	TOTAL CU FT VOLUME	PER CENT CU FT
P2L	34					2000	2000	2000	.001	50	180	230	18000	.05
P2M	613		239100	239100		528400	528400	767500	.40	670	2880	3550	392000	1.12
P2F	1324		419700	419700		680500	680500	1100200	.57	3840	9930	13770	1218000	3.46
P3L	185		110200	110200		602400	602400	712600	.37	20	110	130	121000	.35
P3M	2817	169000	2155000	2324000		6042500	6042500	8366500	4.39	3100	20850	23950	3098000	8.65
P3F	1557		451500	451500		3870700	3870700	4322200	2.26	8570	16040	24610	2538000	7.25
P4L	47	6700	35100	41800	40600	141400	182000	223800	.12		20	20	36000	.10
P4M	2286	887000	1956900	2843900	1828800	13332000	15160800	18004700	9.46	1600	1830	3430	2972000	8.50
P4F	435	141800	1083600	1225400	296200	3042800	3339000	4564400	2.39	570	1170	1740	830000	2.38
TOTALS	9298	1204500	6451100	7665600	2165600	28242700	30408300	38063900	19.96	18420	53010	71430	11223000	31.86
PH2L	141					25400	25400	25400	.01		410	410	34000	.09
PH2M	248	12900	121000	133900	6900	148000	154900	288800	.15	270	650	920	106000	.30
PH2F	53		17900	17900		26600	26600	44500	.02	80	340	420	38000	.11
PH3L	120	16300	68500	84800		81900	81900	166700	.09	10	170	180	36000	.10
PH3M	276		320600	320600	19900	560800	580700	901300	.47	140	270	510	176000	.50
PH3F	136		117400	117400		316100	316100	433500	.23	160	1120	1280	163000	.47
PH4L	638	153100	454300	607400	262900	675600	938500	1545900	.81	60	130	190	242000	.70
PH4M	11960	2320300	14686700	17007000	5334200	15512200	20846400	37853400	19.80	4780	9570	14350	6936000	19.89
PH4F	262	122400	531400	653800	597000	821200	1418200	2072000	1.09	180	100	280	342000	.98
TOTALS	13834	2625000	16317800	18942800	6220900	18167800	24388700	43331500	22.67	5680	12860	18540	8073000	23.14
BH3L	150		54300	54300		304400	304400	358700	.19		200	200	74000	.21
BH3M	75		15800	15800		202100	202100	217900	.11		40	40	41000	.12
BH3F	408	67700	647400	715100	236700	1448300	1685000	2400100	1.26	200	570	770	417000	1.19
BH4L	581	94700	664200	758900	180100	889800	1069900	1828800	.96	60	290	350	322000	.92
BH4M	2366	2271400	4582900	6854300	2361100	4618300	6979400	13833700	7.25	240	710	950	2227000	6.35
BH4F	7601	14730600	29841400	44572000	17436700	14692600	32129300	76701300	40.13				10336000	29.60
TOTALS	11181	17164400	35806000	52970400	20214600	22155500	42370100	95340500	49.90	500	1810	2310	13417000	38.39
UH3M	113	13600	131200	144800	36600	245000	281600	426400	.22				66000	.19
UH3F	48		57600	57600		119000	119000	176600	.09	20	10	30	31000	.09
UH4L	395		272900	272900		520300	520300	793200	.42				131000	.38
UH4M	2411	60300	2266400	2326700	1441900	7035400	8477300	10804000	5.67		240	240	1663000	4.75
TOTALS	2967	73900	2728100	2802000	1478500	7919700	9398200	12200200	6.40	20	250	270	1891000	5.41
C3F	40		90100	90100	107500	487500	595000	685100	.36				103000	.30
C4L	22					39000	39000	39000	.02				6000	.001
C4F	67	4800	248800	253600	212700	670200	882900	1136500	.60				172000	.49
TOTALS	129	4800	338900	343700	320200	1196700	1516900	1860600	.98				281000	.79
GRAND TOTALS	37409	21072600	61641900	82714500	30399800	77682400	108082200	190796700	99.91	24620	67930	92550	34885000	99.59

### 315. Soil and Moisture

315.1 Land Use History. Topography of the refuge varies from the steep range of hills in the northeastern section of Winston County to the nearly level bottom lands bordering Noxubee River. Generally speaking, the topography of the land is gently rolling.

Noxubee, Winston and Oktibbeha Counties were founded in 1833 and from the beginning, the lands were cleared and farmed continuously in cotton, corn and other clean cultivated crops. Cultural practices included burning of crop residue, and plowing, in many cases, perpendicular to the contours. Measures for erosion control, crop rotation, application of soil amendments and fertilizer were uncommon. The depression years of the early 1930's found this area with an eroded and depleted topsoil and the uplands striped with gullies. The people were in debt and stricken with poverty. Depression prices for farm products, coupled with the new threat of the cotton boll weevil, caused the abandonment of many acres of agricultural lands. The bulk of the refuge lands was acquired by the Rural Resettlement Administration around 1934 and transferred to the Soil Conservation Service, which, in turn, in 1940, transferred the lands to the U.S. Fish and Wildlife Service.

Soil and Moisture work was accomplished first during the Fiscal Year 1941. Since that time, approximately \$60,000 of Soil and Moisture funds have been allotted for work on Noxubee Refuge. Contributions from other refuge funds, cooperators, etc., are estimated to be in excess of \$50,000. Early Soil and Moisture work consisted primarily of building check dams and other measures to stop erosion. Records reveal 81,651 check and gully dams were constructed and several thousand pine trees were planted. Erosion was reduced to an insignificant problem.

The present farming program was begun in the early 1950's. Land renovation, including areas around Bluff Lake (Compartments 14 and 15), Jones Creek (Compartment 19), Smith Fields (Compartment 12), Morgan Fields (Compartments 14 and 16), and the Cypress Creek Unit (Compartment 23), was accomplished with Soil and Moisture funds. Most of the refuge has been mapped and its soils classified according to their capabilities. Through the expenditure of Soil and Moisture funds, the soil fertility status has been raised, drainage improved and field sizes increased.

The refuge is located in the northwestern part of the Noxubee County Soil Conservation District, whose office is in Macon, Mississippi; the northeastern part of the Winston County Soil Conservation District, whose office is in Louisville, Mississippi; and the south central part of the Oktibbeha County Soil Conservation District, with its office in Starkville, Mississippi. Field agreements between the refuge and the local SCS Districts are in effect and cooperation is very good.

315.2 Soil and Moisture Problems. As previously stated, active erosion on the refuge no longer is considered a problem. However, the effects of early erosion presently are in evidence. This erosion certainly is a contributing factor in present day S&M problems. Many acres of agricultural land planned in the future refuge farming program have reverted to brush and other undesirable plant species. Land fertility is low generally and soils are acid in nature. Many acres of level bottom lands have been rendered almost worthless by silt and clay deposits eroded from hillsides upstream. Noxubee soils naturally are low in organic matter; however, periods of continuous row-cropping with the accompanying erosion have increased the severity of this condition. Both surface and internal drainage presents complex Soil and Moisture problems.

The objective of Noxubee's Soil and Moisture Program is to restore and maintain refuge soils to a status of high productivity, stabilize soil against erosion, renovate reverted lands to production status required for wildlife and waterfowl food crops and increase the acreage of productive land for waterfowl habitat.

315.3 Soil and Moisture Practices to be Implemented. Almost all refuge lands farmed for wildlife will require additional Soil and Moisture practices and measures to fulfill the objective of soil and water conservation in the refuge's Land Use program.

The initial work in land renovation, in almost every case, includes brush control, land leveling and construction of drainage ditches (Photo 27). Subsequent operations will involve application of one or more of the following measures: soil amendment, fertilization, deep plowing, seeding or sodding, terraces, waterways, reforestation. Other Soil and Moisture practices necessary to increase and maintain fertility, water conservation and soil stability include proper row alignment, cover crops, green manure crops, crop rotation, pest control, rough tillage, weed control and the various phases of water management.

Soil and Moisture measures will be applied annually to all of Noxubee's agricultural lands insofar as the use of approved agricultural practice and maintenance of appropriate improvements, and Soil and Moisture funds programmed under operation generally will be for such purposes. However, the permanent type conservation developments and improvements will be accomplished on a project basis when practical.

The soil conserving measures mentioned in this section are considered to be land development and, as summarized, will be treated as development practices (biological development) for planning purposes.

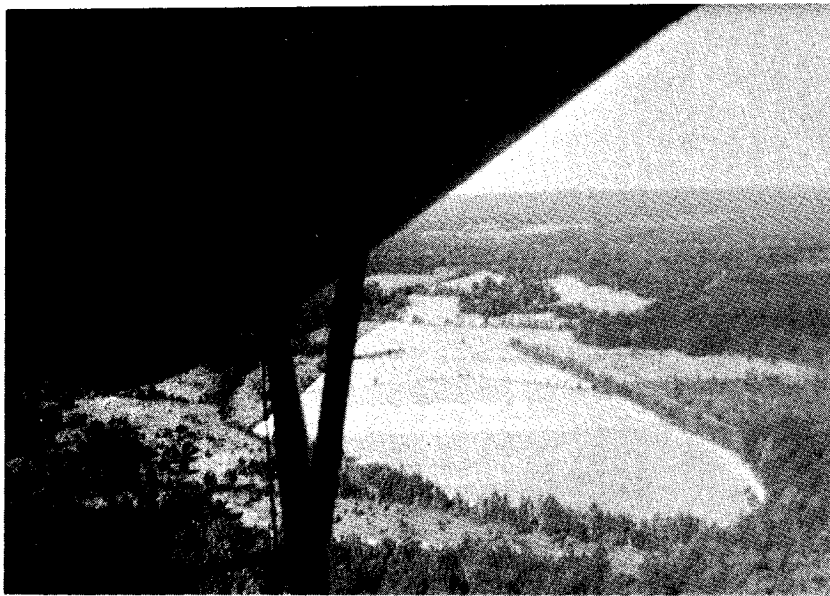


Photo 27  
Pasture area (305 acres) planned for conversion  
to waterfowl habitat.

315.4 Recommended Soil and Moisture Practices by Compartment and Usage.

PRESENT WATERFOWL HABITAT UNITS

<u>PROJECTS</u>	<u>PRACTICES</u>	<u>ACRES</u>
Compartment 12 (Smith Fields)	Clearing	10
	Leveling	144
	Drainage	144
	Deep plowing	50
	Fertilization	144
	Soil amendments	144
	Weed control	50
Total acres		144
Compartment 14 (Morgan Fields, Doyle Arm)	Leveling	100
	Drainage	299
	Soil amendments	299
	Fertilization	299
	Green manure	299
	Weed control	75
Total acres		299
Compartment 15 (Dickerson Arm)	Drainage	27
	Leveling	27
	Fertilization	27
	Soil amendments	27
	Green manure	27
Total acres		27
Compartment 16 (East Morgan Fields)	Drainage	67
	Leveling	67
	Deep plowing	40
	Weed control	67
	Fertilization	67
	Soil amendments	67
	Green manure	67
Total acres		67

<u>PROJECTS</u>	<u>PRACTICES</u>	<u>ACRES</u>
Compartment 18	Brush control	32
	Leveling	32
	Drainage	32
	Soil amendments	32
	Fertilization	32
	Green manure	32
	Weed control	32
Total acres		32
Compartment 19 (Jones Creek)	Brush control	10
	Leveling	330
	Drainage	330
	Soil amendments	330
	Fertilization	330
	Weed control	200
	Deep plowing	100
Total acres		330
Compartment 23 (Cypress Creek)	Leveling	50
	Drainage	117
	Soil Amendments	117
	Fertilization	117
	Green manure	117
	Weed control	50
Total acres		117
GRAND TOTAL ACRES		1,016

PLANNED WATERFOWL HABITAT UNITS

Compartment 9 (Tripplett Pasture)	Brush control	305
	Drainage	305
	Leveling	305
	Soil amendments	305
	Fertilization	305
	Green manure	305
	Weed control	100
	Seeding	75
Total acres		305

<u>PROJECTS</u>	<u>PRACTICES</u>	<u>ACRES</u>
Compartment 11	Clearing	165
	Leveling	165
	Drainage	165
	Soil amendments	165
	Fertilization	165
Total acres		165
Compartment 14	Clearing	275
	Leveling	275
	Drainage	275
	Soil amendments	275
	Fertilization	275
Total acres		275
Compartment 16	Brush control	144
	Drainage	144
	Leveling	144
	Soil amendments	144
	Fertilization	144
	Green manure	144
Total acres		144
Compartment 23	Brush control	61
	Drainage	61
	Leveling	61
	Soil amendments	61
	Fertilization	61
	Green Manure	61
Total acres		61
GRAND TOTAL ACRES		950

UPLAND GAME HABITAT

Compartments 1, 2 and 4	Soil amendments	56
	Brush control	20
Total acres		56

<u>PROJECTS</u>	<u>PRACTICES</u>	<u>ACRES</u>
Compartment 7	Brush control	26
	Soil amendments	26
Total acres		26
Compartment 10	Soil amendments	63
Total acres		63
Compartments 11, 12, 13, 14, 15	Soil amendments	52
	Brush control	25
Total acres		52
Compartments 21 and 22	Soil amendments	41
	Brush control	41
Total acres		41
Compartment 23	Soil amendments	105
	Brush control	50
Total acres		105
Compartment 24	Brush control	14
	Soil amendments	14
Total acres		14
Compartments 26 and 27	Brush control	40
	Soil amendments	40
Total acres		40
GRAND TOTAL ACRES		397

315.5 Summary of Soil and Moisture Practices.

	<u>ACRES</u>
Clearing	450
Brush control (scattered trees, hedgerows, etc.)	748
Drainage	1,966
Leveling	1,700
Fertilization	1,966
Soil amendments	2,363
Deep plowing	190
Seeding	75
Weed control	574
Green manure	1,052
Crop residue, indefinite	
Cover crops, indefinite	
Routine soil and moistures, indefinite	

316. Other Land Resources.

Spontaneous products of the soil, such as fruits, nuts, berries and similar products, may be harvested for personal use only, without charge. The free use permit (Form 3-1400) should be issued in any circumstance that a degree of control is warranted for granting a non-economic refuge privilege. When the value of the product warrants or when better control is desired, Special Use Permit Form 3-1383 will be issued and charges made for these refuge products, or privileges, on the basis of the highest value obtained from formal or informal bids or from the Schedule of Rates (Exhibit 3-D), in effect for the refuge. At times, it will be advantageous to harvest grass or legume seed from permanent sod areas for management purposes or to obtain seed for refuge plantings. Seeds from browse and cover crops, as well as from certain other broadcast crops, often are surplus to the needs of the refuge. Provision is made to harvest such seeds by issuance of a cooperative farming agreement or special use permit in compliance with established Schedule of Rates (Exhibit 3-D).

In event of request for sand, gravel or similar materials, recommended charges for such items are included also in the Schedule of Rates. However, care will be exercised in making such disposals to insure that adequate reserves are retained for future Bureau needs.

## 32. Biological Management

### 321. Fur Animals

321.1 General. Present (1961) estimated number of furbearers residing on the refuge (Exhibit 3-B) and the general range recommended to maintain population levels are as follows:

<u>SPECIES</u>	<u>PRESENT NUMBER</u>	<u>REC. POP. RANGE</u>
Beaver	1,000	10 - 100
Fox - grey	1,000	100 - 1,000
Fox - red	500	100 - 500
Opossum	200	50 - 200
Otter	10	10 - 100
Mink	200	200 - 300
Muskrat	500	250 - 750
Raccoon	2,000	500 - 1,000
Skunk	100	50 - 100

With the exception of beaver, the only furbearing species of commercial value are mink, otter and muskrat, and these are not present on the refuge in sufficient numbers for profitable harvests. Present or potential refuge habitat is insufficient for these animals to become of economic importance in the refuge program. Production objectives do not indicate specific habitat improvements, and population goals are for a reasonable increase for mink and otter and a status-quo for muskrats. Generally speaking, high populations of furbearers on Noxubee are not compatible with the refuge's production and management objectives for waterfowl and other wildlife. When the number of any species of furbearers approaches the upper limits of the recommended population range, a removal program is in order. Fur management is of minor importance to refuge objectives, but is compatible with the overall program as it allows for the harvest of a natural resource that would be otherwise wasted. The purpose of fur management is to harvest surplus animals, thus preventing an over-population of any species and contributing to the local economy by providing an income for trappers.

With the exceptions of mink, otter and muskrats, furbearers should be considered predators or pest animals, and the removal of these species normally will be the responsibility of Bureau personnel.

321.2 Harvest. The harvest of surplus animals, insofar as possible, will be accomplished by local trappers operating under Federal trapping permits. Local residents will receive first priority in selection of trappers. Since a vast reduction in the beaver population is desired, an effort will be made to interest as many reliable persons as possible to trap this species; and as an incentive, traps may be furnished by the refuge.

All trapping by individuals shall be done during the open season allowed by the State of Mississippi and in accordance with the State's trapping laws. State trapping licenses will be required of all trappers.

Unless otherwise specified, the trapper will be allowed to remove animals from the refuge for skinning and drying. Disposition of carcasses shall be the responsibility of the trapper. The trapper shall not sell any furs until the total catch for the period is inspected and divided by refuge personnel.

The refuge manager may suspend trapping operations at any time there exists a need to protect waterfowl concentrations or when conditions threaten successful catches. The refuge manager or his designated representative will make periodic inspections of the trapping operations for conformance with terms of the agreement.

The division of furs will be in accordance with the Approved Schedule of Rates (Exhibit 3-D). Location of trapping units will vary from year to year with shifts in the beaver population and will be designated annually by the refuge manager.

### 322. Animal and Plant Control

322.1 Vegetation Control. Many biological problems pertaining to vegetation control are present on Noxubee. However, these problems are so intermingled with crop, forestry, water and marsh management in most cases, it is unrealistic to identify them separately.

All agricultural land on Noxubee is plagued with weed plants of both annual and perennial species. Johnson grass probably attracts the greatest attention of the crop land weeds. Control programs for Johnson grass, as well as other weed species found on the agricultural land, are included in the farming operations.

Timber stand improvement work and controlled burning of the upland pine lands as measures of vegetation control will be tied directly to timber management.

The control of cattail, primrose, lotus (Photo No. 28) and other undesirable aquatic and marsh land plants is given prime consideration in water management.

Both mechanical and herbicidal controls, as well as various measures in habitat management, will be employed to reduce or eradicate weed species.



Photo 28  
Bluff Lake showing Lotus



Photo Unnumbered  
Bluff Lake

322.2 Animal Control. Predator control is an important phase of Noxubee's management (Photo 29 and 30). The bobcat, fox and "wild" free-roaming dog are the chief predators of upland game. However, trapping is an effective means of controlling these animals and this method will be employed by Bureau personnel as a control measure.

The beaver population on Noxubee is much larger than is desirable and control measures will be employed to reduce the number of beavers to a population compatible with wildlife and timber management (Photo 31 and 32). The beaver population continues to increase under the present system of removal by private individuals under our fur harvest program. Future controls of this species will receive greater participation from refuge personnel. Beaver control is a continuous operation and the refuge's objective is to confine beaver use to its present habitat now rendered useless as timber areas. Research in beaver control will be conducted since both the Southeastern States and the Federal Government are cognizant of problems in wildlife and timber management created by beaver activities. New techniques in beaver control will be employed by refuge personnel as such techniques become available.

"Wild" hogs on the refuge are estimated to number from two to three hundred. These animals show much evidence of domesticated stock and often can be identified as a particular breed. However, in most cases, they are conceived and born of unmarked and unclaimed

parentage and reared entirely on refuge property. Both the Bureau and cooperative farmers have experienced extensive damage to farm crops from wild hogs in various areas on the refuge. Wild hogs also compete with deer, squirrels, turkey and waterfowl for mast produced in the Noxubee River bottom. It is not uncommon to observe areas of several acres completely destroyed by swine. Depredation to wildlife food crops and to farm crops off the refuge is inevitable unless adequate control measures are employed (Photo 33 and 34). Trapping and impounding, to date, have been ineffective. The use of firearms has, as a control measure, reduced the number of animals in localized areas. However, this method has not diminished the total number on the refuge to any appreciable amount. More effective methods for the control of wild hogs must be initiated.

The Mississippi Game and Fish Commission does not protect the wild hog and no conflict in this respect would be forthcoming if wild hogs were to become legal game during refuge managed public hunts. Public hunting would be the quickest, most economical and probably the most effective way to control the population of these animals. Other possible methods of control include issuance of special use permits to individuals having trained dogs to remove wild hogs; use of firearms by refuge personnel, and trapping by both refuge personnel and individuals having special use permits. Poisons or any type of biological warfare will not be used.



Photo 29 (R 16-60, Exp. 18)  
Predator Control at Goose Pen



Photo 30  
Two nights catch of predators



Photo 31 (R 10-60, Exp. 8)  
Beaver damage to 14", Oktoc Creek



Photo 32 (R 2-60, Exp. 23)  
Beaver Control by use of Conibear Traps #330.



Photo 33 (R 12-60, Exp. 7)  
Wild Hog Damage to Corn - Jones Creek Impoundment



Photo 34 (R 16-60, Exp. 22)  
Wild Hog control employed in the Jones Creek Impoundment.

322.3 Bird Control. Blackbirds and crows compete directly with waterfowl and other wildlife for the available food supply. Such competition is most evident in cultivated crops. However, the problem is not considered a serious one at Noxubee. At some future date, it may be desirable to implement a population control program for these two species and, if so, the most current and approved methods will be employed.

322.4 Insect Control. Insects affecting forestry and agriculture and the imported fire ant (Photo 35) present specific problems in refuge management. The control of agricultural crop insects will be primarily through resistant varieties, proper planting dates, cultural practices and applications of insecticides. Forest insects and their controls are covered in the timber management section of this plan.

Observations reveal no actual damage to wildlife by the imported fire ant. However, fire ant mounds are damaging to habitat and the ant is most certainly a pest. Control measures normally should be restricted to spot insecticidal applications of individual mounds.

322.5 Fish Control. Rough fish control is restricted to the removal of gizzard shad, carp and catfish from Bluff Lake. In the past, this operation has been in cooperation with the Mississippi Game

and Fish Commission with encouraging results (Photo 36). Several thousand pounds of shad are removed from Bluff Lake Spillway each year by sport fishermen for use as bait. Trotline fishermen remove several thousand pounds of catfish, grindle, gar and eel each year. These controls appear adequate for a balanced rough fish-game fish population.

Fishery management on Noxubee is confined to Bluff Lake and the proposed Loakfoma Lake. However, fishing will be permitted on various streams throughout the refuge. The fishery resource will be given a second priority to waterfowl in habitat management. The management of all fishery habitat is covered in the Water Management Section of this plan.

The principal game fishes in Bluff Lake are bass, crappie, and bluegills, and these species will be introduced into Loakfoma Lake when the proposed impoundment is flooded.

Personnel from the Branch of Fishery Management are requested to conduct periodic surveys on fishery conditions and provide management recommendations for implementation on Noxubee.



Photo 35 (R 11-61, Exp. 7)  
Typical Fire Ant (Imported) mound in NW 1/4 Sec. 15 T 16 R 14

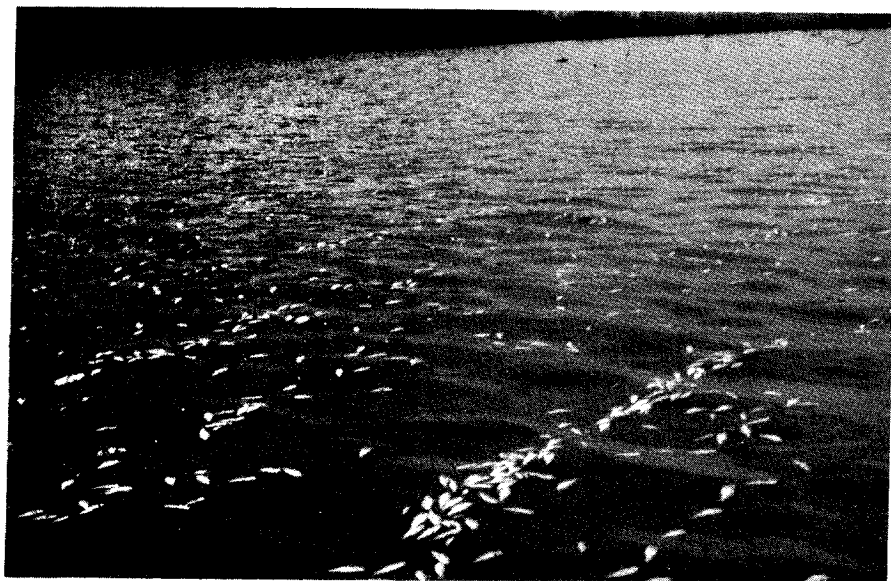


Photo 36 (R 14-60, Exp. 9)  
Rough Fish (Shad) Control on Bluff Lake

323. Disposal of Surplus Animals.

In the logic intended under Section 3473 of the Wildlife Refuges Manual, it is impossible at this time to visualize a surplus of animals in the large game classification. However, excess animals, including deer, turkey and other indigenous species, may well occur.

First preference in the disposal of excess animals on Noxubee will be for restocking public areas administered specifically for game production, harvest through public hunting, and, in case of fur animals, through a trapping program on a cooperative or fee basis. Based on past records and indications of present needs, requests by the State of Mississippi for animals to restock public areas will be few or non-existent, and public hunting on the refuge is expected to be the principal method of harvesting excess game animals and birds.

324. Animal and Plant Introduction.

Noxubee Refuge has as a stated objective the establishment of a wintering Canada goose flock. A captive decoy flock in varying numbers has been at Noxubee for the past several years. Noxubee participated in the Canada goose transplant program prior to 1959 when the program was disbanded in favor of birds-of-the-year transplants.

Noxubee received 100 young Canada geese in the fall of 1959 and another shipment of 100 birds in the fall of 1960 (Photo No. 37). These birds were trapped at Horse Shoe Lake and transplanted by refuge personnel to Noxubee. A third shipment of 100 birds-of-the-year is planned for 1961. The 1959 birds will be released at the end of the gunning season 1962 with the expectation that they will migrate to the northern breeding grounds and return to Noxubee in their subsequent southward migrations.

During the early stages of refuge development, Noxubee was initially stocked with both deer and turkey transferred from other refuges (Photos 38 and 39). Refuge plans do not call for the introduction of any new animal species other than for encouragement of desirable birds and animals which may seek to establish residence.

Management plans do not call for the introduction of new plant species on the refuge. The Loakfoma Lake will be planted to desirable aquatics, and the plants now present in Bluff Lake are recommended.

New species and improved varieties of agronomic crops will be planted in the Noxubee farming program. However, these plantings will not include any true exotic plants and only varieties that have general approval will be considered.



Photo 37  
Sexing, banding, pulling. primaries



Photo 38  
Initial Deer Restocking, 1950.



Photo 39  
Initial Turkey Stocking in the late 1940's.

325. Hunting and Fishing.

Primary wildlife management objectives for Noxubee include not only provision for a sanctuary and protection of wildlife, but also provision for public hunting of upland game, turkey, deer and waterfowl. Current regulations allow hunting of turkey (spring gobbler hunt), squirrels, rabbits, bobcats, foxes, and crows (Photos 40 and 41), and these hunts will continue so long as populations of these species do not fall below the present levels (Exhibit 3-B).

Public hunting on the refuge for ducks is planned for the time when the proposed green timber reservoirs on Oktoc and Jones Creeks are completed. Canada goose hunting on Noxubee is not foreseen for the immediate future. However, when a sizeable refuge flock is established and if an adequate harvest is unattainable on nearby privately owned lands, consideration will be given to public hunting of geese on the refuge.

Opening the refuge to dove hunting should be given consideration. Dove hunting should be allowed only in the early season since late season hunting would interfere with waterfowl management.

The removal of surplus animals by public hunts has been practiced since 1949 with no unfavorable reactions and considerable benefits have accrued to the refuge.

Public fishing in Bluff Lake is managed by the Mississippi Game and Fish Commission pursuant to a cooperative agreement between the State and the Bureau. The State issues a special fishing permit for which a fee of fifty cents per day for adults and twenty-five cents per day for children is charged. When adequate facilities can be provided by use of Bureau funds all recreational activities should be managed by refuge personnel.

Public fishing in Bluff Lake, as well as in the several natural streams, should continue, and provision for public fishing is recommended for the Loakfoma Lake. One of the refuge's stated objectives is for free public fishing on the permanent impoundment when not in conflict with waterfowl management.

Periodic reviews will be made of the wildlife and fishery resources and amendments to Noxubee's "Procedure Governing Public Hunting and Fishing on National Wildlife Refuges" will be submitted for review and appropriate action by Regional and Central Office Review Committees.



Photo 40 (R 19-60, Exp. 11)  
Deer Harvest (two of the 103 taken during the 1960-61 season)



Photo 41 (R--, Exp. 9)  
Squirrel Hunters - Noxubee Public Squirrel Hunt, 1958.

### 33. Protection

#### 331. Law Enforcement.

The jurisdictional responsibility assumed on Noxubee is of the proprietary nature and covers the refuge in its entirety.

Adverse holdings within the refuge boundaries render protection and law enforcement difficult. Management practices are less effective along the perimeter of privately-owned land due to human activities. Roads leading to non-government owned tracts cannot be closed to travelers bearing firearms or facilities of wildlife molestation. Gunshots, fires, etc. on these adverse holdings often demand investigation by refuge personnel. Fires starting on private land are a constant threat to the refuge and fire-fighting is always a dangerous, time-consuming and costly operation.

Livestock trespass laws in the Noxubee section of Mississippi are not enforced on private, state and other federal lands. Free roaming cattle are prevalent on the refuge and horses, mules, swine, goats and other farm animals are not uncommon. Attempts to enforce trespass laws on Noxubee have been of no avail.

Law enforcement problems dealing with livestock trespass, fires and wildlife violations will decrease as the land acquisition program progresses.

Non-conforming uses on Noxubee are minimum, and public use activities are localized to a large degree, being centered primarily around permanent water areas.

Cooperation with state and federal agencies is excellent at Noxubee, particularly in game law violations. Continued cooperation in the same manner is expected. However, refuge law enforcement personnel do not have authority to enforce state laws and, likewise, state wardens do not have authority to enforce federal laws.

Illegal activities most often practiced on Noxubee are livestock trespasses and poaching of upland game along refuge boundaries near interior private holdings.

### 332. Fires, Floods and Other Acts of God

332.1 General. Danger of flood damage to buildings or equipment at Noxubee is insignificant. Once or twice each year waters of the Noxubee River and its tributaries overflow and spread out over the lowlands. This overflow causes damage to earth levees and minor sheet erosion occurs from water currents along natural drains. Any remedy to this situation other than through structural designs and annual maintenance is not practical.

Tornadoes occur frequently throughout the area and tornado warnings are considered commonplace. Damage by winds is restricted normally to timber and levees impounding relatively large bodies of water.

Civil defense shelters are not available on the refuge and provisions for such facilities are not included in this plan.

### 332.2 Fire Plan

General. Fire season is from mid-September through March; however, during severe droughts this period is extended. Prevention of wildfires and the lack of prescribed burning on most of the refuge have increased the fire hazard to a high point, especially in pine and pine-hardwood types where fuels accumulate fast and are highly inflammable.

The main causes of woods fires are incendiary, smokers, or debris burning. Most of the incendiary and smoker fires occur early in the fire season while debris burning usually occurs in early spring.

Fire Prevention. Fire prevention will be accomplished by education, fire lines, regulation of public use and elimination of hazards by employing the following practices:

Signs and posters placed in key locations for public notice.

Fire prevention stressed by refuge personnel at community and civic gatherings.

Assignments of all refuge employees to specific positions in the fire organization.

Instructions to all refuge personnel on the types, uses and locations of fire equipment.

Isolation of high risk areas by fire lanes, including the refuge perimeter.

Restriction of all refuge areas with the exception of designated recreational areas from camping and campfires.

Provision of adequate barriers at the entrance of refuge maintained roads to restrict public use.

Instructions to permittees of Government land on fire prevention and suppression in case of accidental fires occurring while conducting their operations.

Quarterly safety inspections with proper corrective measures.

Fire Presuppression. Organized detection of fires will be accomplished by cooperation with the Mississippi Forestry Commission, use of the fire tower at Bluff Lake, and ground patrol over planned routes. Unorganized detection comes from the reporting of fires by individuals. The detection system is based on the 8-100-0 meter. On fire danger class days 1-4, detection will be by the tower lookout system of the Mississippi Forestry Commission. On days of low ground visibility, when refuge telephones are inoperable, and on class days 5, the tower at Bluff Lake will be manned. On all class days 5, ground patrols will be assigned planned routes based on fire risk.

Fire Suppression and Presuppression. Assignment of refuge personnel responsibilities directed towards fire presuppression will be governed by seasonal fire danger ratings with day-to-day assignments being made by the officer-in-charge. On one-man fires, the officer-in-charge will dispatch whatever personnel is available for suppression work.

On large fires, job assignments are as follows:

<u>No.</u>	<u>Title</u>	<u>Job</u>
1	Refuge Manager	Fire boss or radio dispatcher
1	Asst. Ref. Mgr.	Fire boss or crew boss
1	Clerk	Radio dispatcher
2	Foresters	Fire boss or crew boss
2	Wildlife Aid	Crew boss or tractor operator
1	Mechanic	Tractor operator or fire fighter
2	Equipment Operator	Tractor operator or fire fighter
2	Maintenanceman	Fire fighter
1	Fire Control Aid	Tower lookout

Communication. Refuge headquarters is the communications hub. When fires are detected, they will be reported by telephone to the radio dispatcher. This information is passed to the officer-in-charge who sends the fire crews into action by radio and personnel contact.

Fire Equipment. Refuge fire fighting equipment is adequate for suppressing all types of surface fires. Equipment readiness is the responsibility of the crew boss. Three truck mobile units with radios, one three-man mobile unit with radio, one base station radio dispatching unit, and two tool caches are on standby for fire action.

Additional Personnel or Equipment Sources. Six fire fighting organizations from which additional personnel or equipment may be secured in emergency periods are listed in order of availability: Mississippi Forestry Commission, Mississippi State University Forestry Department, U.S. Forest Service, Tombigbee National Forest, D. L. Fair Lumber Company, Richard Barge Lumber Company, and the Natchez Trace Parkway.

The Mississippi Forestry Commission has heavy equipment for most fire types while the others are adequately equipped for surface fires.

Whenever an emergency arises, other personnel (not regular employees) are asked to fill the need by the officer-in-charge. The Emergency Employee Contract and Time Sheet (Form No. 1-530) is used exclusively for this purpose.

Fire Control Map. The fire occurrence map displayed in the refuge office, which shows the location and fire causes for a 10-year period, is also the fire control map and provides information on the availability of fire fighters and supervisors, radios and telephones, equipment and tool caches, towers and observation points, fire lines and fire roads, individual fire control units, and building sites.

Fire Suppression. Fire crews will be assigned stand-by duty regulated by fire danger class days. On class days 1-4 radio contact between mobile units and dispatcher will be made at periodic intervals, with the frequency increasing as conditions become more hazardous, regulated by the dispatcher. On class days 5, radio contact will be continuous unless for assigned purposes.

Assembly and transportation of the fire crew are the responsibilities of the officer-in-charge, along with securing additional equipment and personnel.

The fire attack is planned and directed by the fire boss or crew chief, being governed by the type and size of fire, rate of spread and weather conditions. Safety, equipment repair and maintenance, mop-up action, and fire report (DI-1200) also are the responsibilities of the fire boss or crew boss.

Building. Fire extinguishers, water barrels, sand barrels, water hydrants and fire hoses will be located and maintained at strategic points for emergency use. These are checked quarterly for proper maintenance and repairs by the refuge manager.

#### 34. Recreation

Conformance to Types of Recreational Use with Regard to Bureau Policies. With minor exception or broad interpretation of policy, Noxubee's recreational activities, both present and proposed, conform with the Bureau's "Procedure Regulating Recreational Use of National Wildlife Refuges." However, only small restrictions are placed on public use of the refuge for nature observation, photography, sightseeing or picnicking. Certain refuge roads are closed year-round and others closed when public use to the area may be detrimental to wildlife. Construction of private cabins on the refuge will not be permitted. Swimming, boating and hunting will be strictly in compliance with Bureau policies. Providing of minimum camping facilities during period of public hunts on the refuge and in designated area, such as present picnic site at Bluff Lake, will be considered.

The fishing in Bluff Lake is not contrary to regulatory procedures; however, it is not in keeping with the trend for the provision of free public fishing in refuge waters. Bluff Lake, consisting of 1,200 acres, is managed on a cooperative agreement basis between the Bureau and the Mississippi Game and Fish Commission. The lake is open from March 1 to October 31 each year with the State charging a fee for a permit to fish (\$.50 for adults and \$.25 for children). The State also provides boats for rent to the public on Bluff Lake. The State uses the proceeds from these permits and boat rentals for improvement and maintenance of the 2.5 acre picnic area and rough fish control and for salaries of the personnel assigned to the area.

Free public fishing on all refuge waters is recommended for such time as the existing cooperative agreement with the State feasibly can be cancelled.

#### Concessions and Local Sponsorship of Recreational Facilities.

The use of concessioners is desirable and should be utilized to facilitate recreational expansion on Noxubee. The refuge staffing pattern is designed to be supplemented by a concessioner for the Bluff Lake Recreational Area and will not be adequate if all recreational activities are managed by refuge personnel.

Concessions will be authorized on the refuge on a contractual basis, when not in cooperation with the State, with the charges and fees being commensurate with the cost and services involved.

Facilities proposed for the refuge recreational areas should be completely developed by the Bureau, providing tables, pavillions, water system, barbecue pits, toilets, garbage containers and necessary equipment to insure enjoyable but orderly use.

35. Cost Summary for Upkeep of the Physical Plant

General. With final development including biological aspects, funds required for Noxubee will be those needed for refuge operations embracing maintenance, management, protection, recreation, conservation education, Soil and Moisture and expenses for sales (Exhibit 3-I). Biological development may be programmed annually under cropland management, Soil and Moisture or as development projects. For presentation purposes, Soil and Moisture improvement projects are listed as development items and are not included in the cost figure in Exhibit 3-I for development and post-development operations. However, a Soil and Moisture item is included for upkeep of soil and water conserving facilities.

The various refuge functions justify the ownership, upkeep, and replacement of equipment, as expressed in Exhibit 3-J.

Maintenance. The maintenance functions will require annual jobs dealing with levee and water control structure repairs; grading and sloping of roads and trails; re-wiring and reposting of fences; boundary posting; building repairs; repair and replacement of bridges; and general repair and maintenance of utility lines and facilities.

Management. This function includes the management of croplands, timberlands, and marsh and water areas. Permanent sod areas are considered as croplands both for development and post-development periods. Cooperative farming reduces the cost of cropland management. Approximately two-thirds of the refuge's agricultural lands is planned for operation under cooperative farming agreements and the remaining acreage by refuge personnel. Prescribed burning and related practices of forest lands are charged to timberland management while fire suppression and presuppression are accountable as protection.

Protection. This function covers the enforcement of laws and regulations and the protection of the lands and resources of the refuge.

Expenses for Sales. This function for Noxubee is closely associated with timber management as receipts from timber sales are the primary source of refuge revenue.

Recreation. Cost attributed to recreation includes maintenance of picnic, parking and recreational grounds; and supervision directly associated with the refuge's recreational use. The cost of this function will increase as refuge development, recreation-wise, progresses.

Population Management and Conservation Education. The estimated annual costs of these functions are expressed in Exhibit 3-I and include wildlife surveys and censuses; animal control projects; and major conservation education contacts.

Soil and Moisture. All biological improvements of agricultural lands are included under the Soil and Moisture Program. Habitat development in view of soil and water conserving practices is programmed as development. However, certain maintenance of soil and water conserving facilities is necessary for programming as refuge operations (Exhibit 3-I). Other Soil and Moisture projects may be programmed as development or cropland management.

## EXHIBIT 3-I

## ESTIMATED ANNUAL COST OF REFUGE OPERATION

PROGRAM ITEM	TYPE UNIT	CURRENT OR FIRST PHASE		DEVELOPMENT		POST DEVELOPMENT	
		UNIT	FUNDS	UNIT	FUNDS	UNIT	FUNDS
MAINTENANCE			<u>18,300</u>		<u>36,500</u>		<u>35,155</u>
Levees-dikes	Miles	6.67	<u>2,500</u>			12.13	<u>6,900</u>
Water control structures	No.	15	2,000			25	3,750
Ditches	Miles	.25				5	700
Roads and trails	Miles	89	4,900			124	9,200
Fencing and posting			2,300				
Fencing	Miles	21.0				79	2,300
Posting	Miles	130.0				75	375
Buildings	No.	22.0	4,100			16	
	Sq.Ft.					23,520	5,000
Utilities			1,400				
Lines	Miles	17				17	
Facilities	Number	9				9	1,000
Bridges & culverts	Number	12	1,100			177	5,930
MANAGEMENT			<u>37,400</u>		<u>37,500</u>		<u>48,000</u>
Croplands	Acres	996	<u>17,700</u>		<u>20,000</u>	2,363	<u>30,000</u>
Timberlands	Acres	41,513	4,400		11,500	40,185	12,000
Grasslands	Acres	858	10,500				
Marsh and Water	Acres	1,600	4,800		6,000	2,250	6,000
PROTECTION			<u>5,900</u>		<u>13,000</u>		<u>13,000</u>
Fire suppression and presuppression		42,267	3,000		5,000	42,548	5,000
Enforcement	Acres	44,798	2,900		8,000	44,798	8,000
EXPENSES FOR SALES			<u>13,100</u>		<u>17,000</u>		<u>20,000</u>
RECREATION					<u>2,000</u>		<u>4,000</u>
Physical facilities	Acres	1		2	<u>2,000</u>	2	<u>2,000</u>
Supervision							2,000
POPULATION MANAGEMENT			<u>9,600</u>		<u>9,000</u>		<u>8,000</u>
Surveys and Censuses	Acres	44,798		44,798		44,798	
Animal Control	No. Proj	3		3		4	
CONSERVATION EDUCATION	Contacts	6	<u>2,000</u>	12	<u>3,000</u>	12	<u>4,000</u>
SOIL AND MOISTURE	Acres	1,500	<u>4,600</u>		<u>5,000</u>	2,363	<u>5,000</u>
TOTAL			90,900		123,000		137,155

## EXHIBIT 3-J

EQUIPMENT NECESSARY FOR REFUGE OPERATION

<u>Items</u>	<u>Replace Schedule</u>
Station wagon (sedan): 6 cylinder	5 years
Truck Pickup, $\frac{1}{2}$ ton	5 years
Truck Pickup, $\frac{1}{2}$ ton	5 years
Truck Pickup, $\frac{1}{2}$ ton	5 years
Truck Pickup, $\frac{1}{2}$ ton	5 years
Truck, $\frac{1}{2}$ ton, 4-wheel drive	5 years
Truck, $\frac{1}{2}$ ton, 4-wheel drive	5 years
Truck, $\frac{1}{2}$ ton, 4-wheel drive	5 years
Truck, $\frac{1}{2}$ ton, 4-wheel drive	5 years
Truck, 2-4 ton, stake body	9 years
Truck, dump, $2\frac{1}{2}$ tons	7 years
Truck, tractor, 5 ton w/lowboy	9 years
Truck, fire, tandem drive	9 years
Truck, fire, tandem drive	9 years
Tractor, 30-35 hp., crawler	10 years
Tractor, 30-35 hp., crawler	10 years
Tractor, D-7 size, crawler	10 years
Tractor, D-7 size, crawler	10 years
Tractor, TD-9 size, crawler w/dozer	10 years
Tractor, 20 hp., crawler	10 years
Tractor, wheel, 50-80 hp.	5 years
Tractor, wheel, 50-80 hp.	5 years
Tractor, wheel, 20-35 hp.	5 years
Tractor, wheel, 20-35 hp.	5 years
Dragline, truck mounted, $3/8-1/2$ cu. yd.	10 years
Grader, motor	10 years
Grader, pull	10 years
Ripper, road	10 years
Dragline, truck mounted, $3/8-1/2$ cu. yd.	10 years
Boat: outboard 12'-16', 10 hp.	15 years
Crane, hydraulic	10 years

#### 4. Budgetary

##### 41. Development Recapitulation.

Exhibit 4-A presents an estimate of cost for items of construction and a recapitulation of proposed development.

For budgetary and developmental purposes, the refuge is divided into seven units. Each unit consists of an assigned number of compartments.

Headquarters Unit. This unit consists of the headquarters site on Bluff Lake, buildings, roads and trails for refuge use, recreation areas on Bluff and Loakfoma Lakes and boundary fences.

Unit I (Compartments 1, 2, 3, 4, 5, 6, 7, 8). This unit includes 82 acres of biological development for upland game birds and deer.

Unit II (Compartments 9, 10, 11, 12, 13). This unit includes Green Timber Reservoir No. 6, the two Smith Field dewatering impoundments and 716 acres of fields and upland game food plots.

Unit III (Compartments 14, 15, 16). This unit includes Loakfoma Lake Impoundment, Morgan Field dewatering impoundments and 825 acres of biological development.

Unit IV (Compartments 17, 18, 19, 20). This unit contains Green Timber Reservoirs No. 1, 2, 3, and 4, Prisock Field dewatering impoundment, Bluff Lake Impoundment, Ross Branch storage reservoir, and 362 acres of biological development work.

Unit V (Compartments 21, 22, 23, 24). This area consists of all refuge land north of the Noxubee River and south of Highway # 25 and includes Green Timber Reservoir No. 5, Keaton Tower Field dewatering impoundment and 329 acres of biological-development work.

Unit VI (Compartments 25, 26, 27, 28). This unit includes all refuge land north of Highway # 25. No major development work is scheduled for this unit except scattered upland game food plots totaling 40 acres.

The developments in each unit are staggered over a three-phase development program. Priorities are indicated by phases as shown in Exhibit 4-A. Major development projects should be scheduled for completion within 3 years after adequate funds are allotted, whereas biological development should be spread over all three phases as wildlife needs dictate.

## EXHIBIT 4-A

RECAPITULATION OF COST - MASTER PLAN  
NOXUBEE NATIONAL WILDLIFE REFUGE  
TOTAL ESTIMATED COST \$1,120,388

Noxubee Refuge, 44,798 acres	Development			Item	TOTAL
	Phase			Cost	COST
	1st	2nd	3rd		
Headquarters Unit and related items					\$379,014
<u>Buildings</u>					<u>97,750</u>
Residences (2), std. type, 3-bedrooms w/carports				\$ 44,000	
Shop, std. type 31' x 65'				15,000	
Building, paint and oil, 20' x 30'				2,300	
Building, Dynamite, 10' x 10'				4,500	
Office Building: 29' x 61'				18,000	
Fence, Children's playground				1,200	
Engineering and Contingencies: 15%				12,750	
<u>Roads, Trails and Fences</u>					180,550
Access Roads, grading, grubbing and graveling, 35 miles. Includes approximately 25 bridges and 140 culverts.				134,000	
Fences, Boundary, 58 miles, 4-strand barbed wire w/post spaced 10' apart.				23,000	
Engineering and Contingencies: 15%				23,550	

EXHIBIT 4-A  
(Continued)

	Development Phase			Item Cost	Total Cost
	1st	2nd	3rd		
<u>Unit No. 1 (Compartments, 1, 2, 3, 4, 5, 6, 7, 8)</u>					\$ 3,746
<u>Biological Development</u>					3,746
Brush Control, 26 acres @ \$100				\$ 2,600	
Soil Amendments, 82 acres @ \$8				656	
Engineering and Contingencies: 15%				490	
<u>Unit No. 2 (Compartments 9, 10, 11, 12, 13)</u>					123,352
<u>Water Facilities</u>					56,670
Green Timber Reservoir No. 6					
Constructing dike 4,560 L.F., 450' spillway, corrugated metal pipes w/flash board riser				49,800	
Engineering and Contingencies: 15%				6,870	
<u>Biological Development</u>					66,682
Clearing, 175 acres @ \$100				17,500	
Brush Control, 317 acres @ \$50				15,850	
Drainage, 614 acres @ \$2				1,228	
Land leveling, 614 acres @ \$5				3,070	
Fertilization, 614 acres @ \$15				9,210	
Soil Amendments, 703 acres @ \$8				5,624	
Deep Plowing, 50 acres @ \$10				500	
Seeding, 75 acres @ \$10				750	
Weed Control, 150 acres @ \$8				1,200	
Green Manure, 305 acres @ \$10				3,050	
Contingencies: 15%				8,700	

EXHIBIT 4-A  
(Continued)

	Development			Item Cost	Total Cost
	1st	2nd	3rd		
<u>Unit No. 3 (Compartments 14, 15, 16)</u>					<u>\$190,219</u>
<u>Water Facilities</u>					116,575
Loakfoma Lake Impoundment				\$ 70,000	
Construction dike, 4480 L.F. w/simple stoplog structure 47' wide					
Clearing, lake bed, 500 acres				30,000	
Engineering and Contingencies: 15%				16,575	
<u>Biological Development</u>					73,644
Clearing, 257 acres @ \$100				25,700	
Brush Control, 157 acres @ \$50				7,850	
Drainage, 812 acres @ \$2				1,624	
Land Leveling, 613 acres @ \$5				3,065	
Fertilization, 813 acres @ \$15				12,195	
Soil Amendments, 838 acres @ \$8				6,704	
Deep Plowing, 40 acres @ \$10				400	
Weed Control, 142 acres @ \$8				1,136	
Green Manure, 537 acres @ \$10				5,370	
Contingencies: 15%				9,600	
<u>Unit No. 4 (Compartments 17, 18, 19, 20)</u>					<u>312,693</u>
<u>Water Facilities</u>					294,137
Green Timber Reservoir No. 1					
Spillway repair, rip-rap, 600'				9,800	
Green Timber Reservoir No. 2					
Spillway repair, rip-rap, 600'				9,800	
Green Timber Reservoir No. 3					
Constructing 6,500 L.F. of dike w/505' of spillway, two 36" corrugated metal pipes w/flash board risers.				60,000	
Green Timber Reservoir No. 4					
Constructing 4,335 L.F. of dike w/480' spillway, two 36" corru- gated metal pipes w/flash board risers.				40,000	

EXHIBIT 4-A  
(Continued)

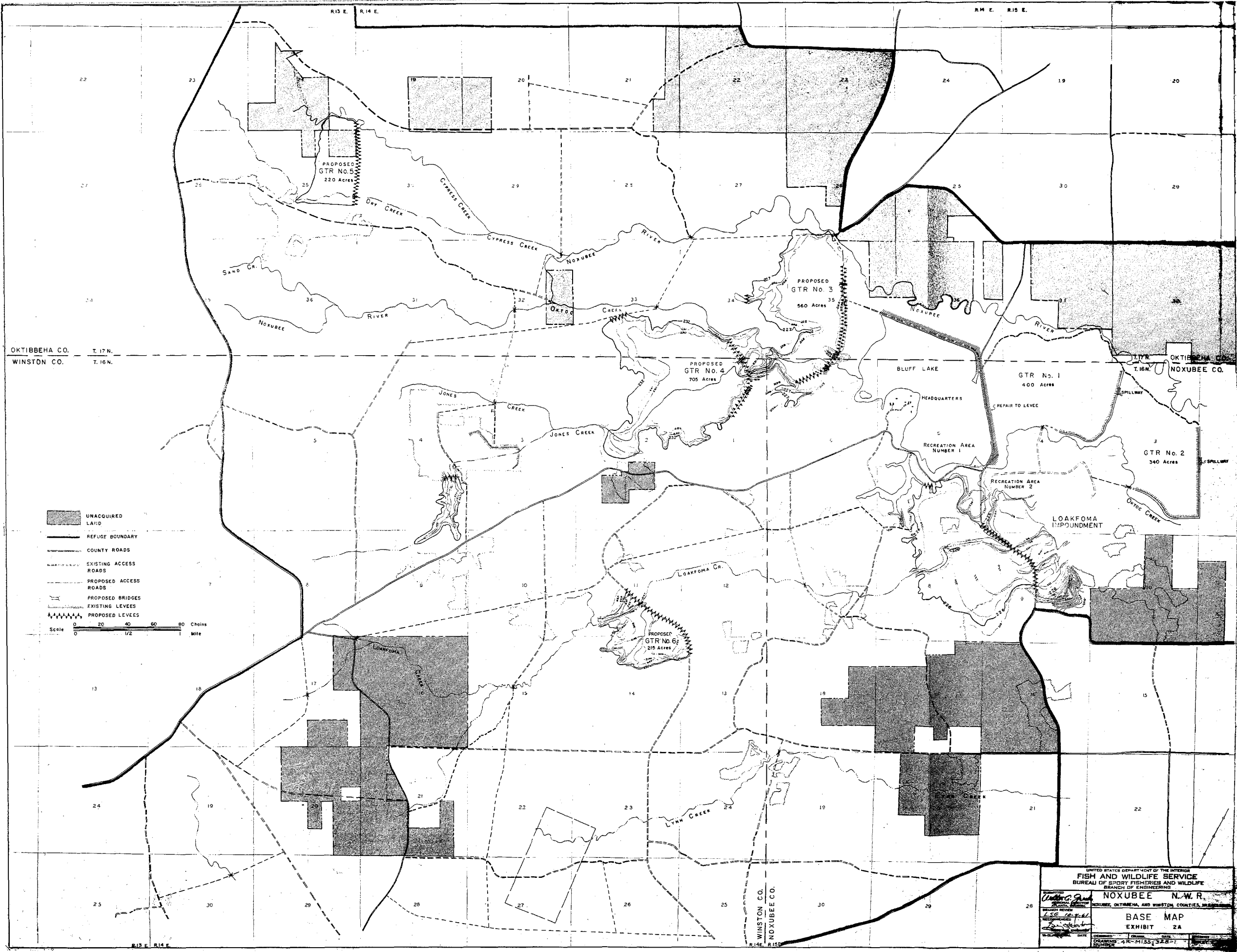
	<u>Development</u>			<u>Item</u>	<u>Total</u>
	1st	2nd	3rd	<u>Cost</u>	<u>Cost</u>
<u>Unit No. 4 (Continued)</u>					
Ross Branch Storage Reservoir					
Constructing 580 L.F. of dike, 40' spillway, one 16" cast iron pipe and pipe valve				\$ 34,000	
Bluff Lake Levee					
Repairing 10,500' of levee and roadway. Establishing of grade, grubbing, rip-rapping shore line, sodding or seeding.				102,250	
Engineering and Contingencies: 15%				38,287	
<u>Biological Development</u>					\$ <u>18,556</u>
Brush Control, 42 acres @ \$50				2,100	
Drainage, 362 acres @ \$2				724	
Land Leveling, 362 acres @ \$5				1,810	
Fertilization, 362 acres @ \$15				5,430	
Soil Amendments, 362 acres @ \$8				2,896	
Deep Plowing, 100 acres @ \$10				1,000	
Weed Control, 232 acres @ \$8				1,856	
Green Manure, 32 acres @ \$10				320	
Contingencies: 15%				2,420	

EXHIBIT 4-A  
(Continued)

	Development Phase			<u>Item Cost</u>	<u>Total Cost</u>
	1st	2nd	3rd		
<u>Unit No. 5 (Compartments 21, 22, 23, 24)</u>					\$ <u>52,696</u>
<u>Water Facilities</u>					36,535
Green Timber Reservoir No. 5, Constructing 3,960 L.F. dike with 250' spillway, corrugated metal pipe w/flash board riser. Engineering and Contingencies: 15%				\$ 31,770 4,765	
<u>Biological Development</u>					16,161
Brush Control, 166 acres @ \$50				8,300	
Drainage, 178 acres @ \$2				356	
Land Leveling, 111 acres @ \$5				555	
Fertilization, 178 acres @ \$15				2,670	
Weed Control, 50 acres @ \$8				400	
Green Manure, 178 acres @ \$10				1,780	
Contingencies: 15%				2,100	
<u>Unit No. 6 (Compartments 25, 26, 27, 28)</u>					<u>2,668</u>
<u>Biological Development</u>					2,668
Brush Control, 40 acres @ \$50				2,000	
Soil Amendments, 40 acres @ \$8				320	
Contingencies: 15%				348	
<u>All Units</u>					<u>56,000</u>
<u>Water Facilities</u>				56,000	
Construction of additional Green Timber Reservoirs to provide 560 acres of water habitat. Sites not yet surveyed.					

EXHIBIT 4-A  
(Continued)

	Development			Item Cost	Total Cost
	1st	2nd	3rd		
<u>Recreational Development</u>					\$100,714
<u>Bluff Lake Recreational Area</u>					70,900
Shelters, 2, open sides, concrete floor, barbecue pits, 30' x 40'				\$ 10,000	
Rest Rooms, 2, combination men and women, septic tank, 10' x 20'				8,800	
Bathhouse, 1, concession stand, toilets, 56' x 40'				28,500	
Well, 1, 6"D x 800' deep, pump and tank				8,000	
Picnic tables, 50, concrete (\$65 each)				3,250	
Barbecue pits, 25, coal or wood				2,500	
Garbage disposal, 20, galvanized cans, concrete base.				600	
Engineering and Contingencies: 15%				9,250	
<u>Loakfoma Lake Recreation Area</u>					29,814
Shelter, 1, open sides, concrete floor, 30' x 40'				5,000	
Rest Room bldg., 1, combination men and women, septic tank, 10' x 20'				4,400	
Well, 1, 6"D x 800' deep, pump and tank				8,000	
Ramp, boat launch, concrete				1,200	
Picnic tables, 25, concrete (\$65 each)				1,625	
Barbecue pits, 12, coal or wood, \$100 each				1,200	
Parking Area and Access Road to Ramp, 6,430 cu. yds. @ \$.70				4,500	
Engineering and Contingencies: 15%				3,889	



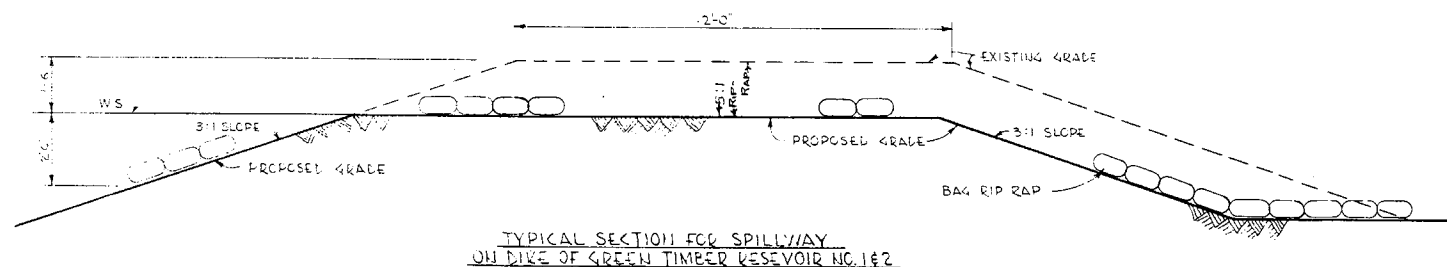
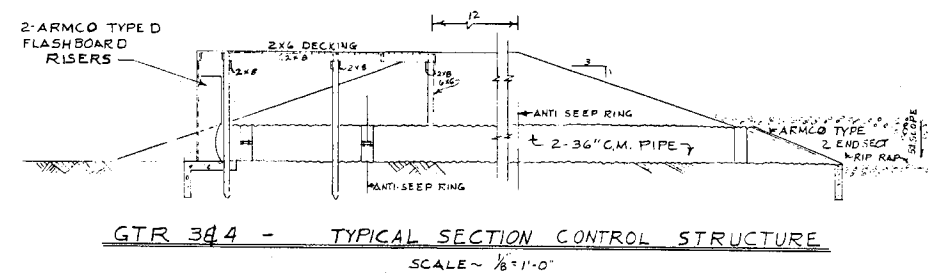
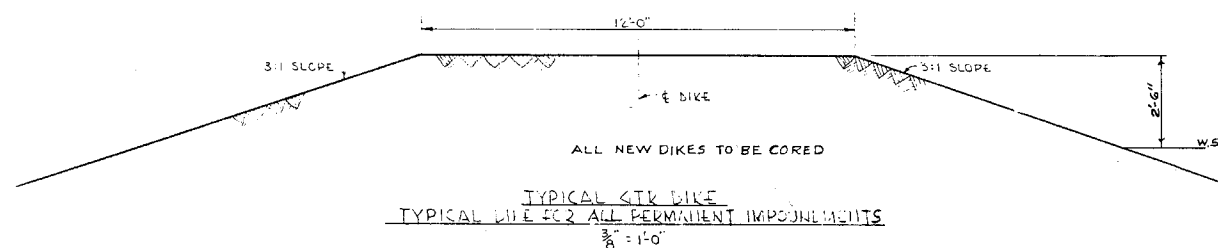
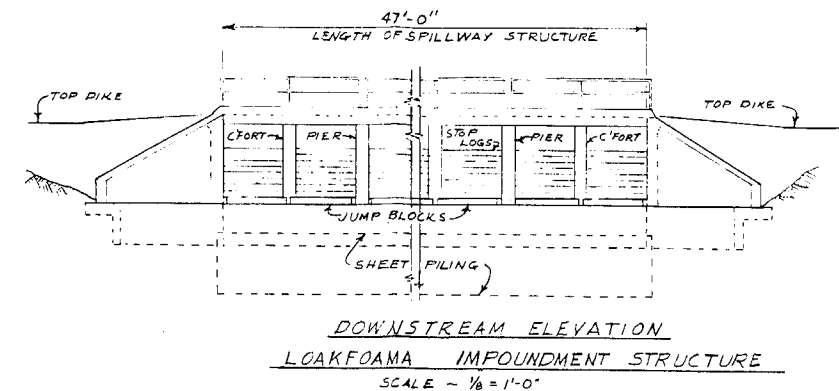
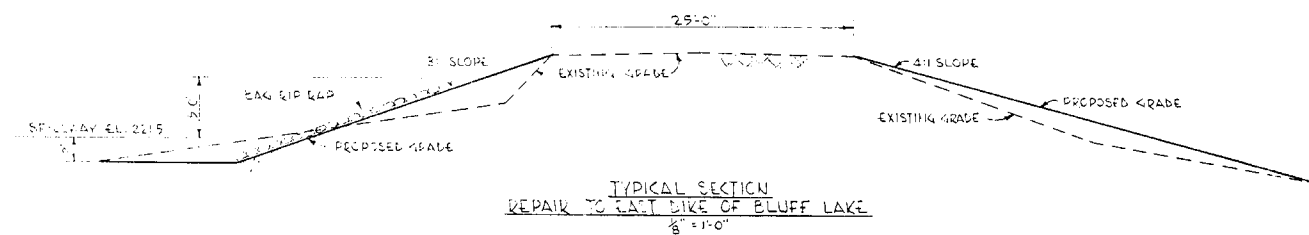
UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE  
BRANCH OF ENGINEERING

*Walter G. Ford*  
REGIONAL ENGINEER  
DATE: 10-24-41  
BY: [Signature]  
CHECKED: [Signature]

NOXUBEE N.W.R.  
NOXUBEE, OKTIBBEHA, AND WINSTON COUNTIES, MISSISSIPPI

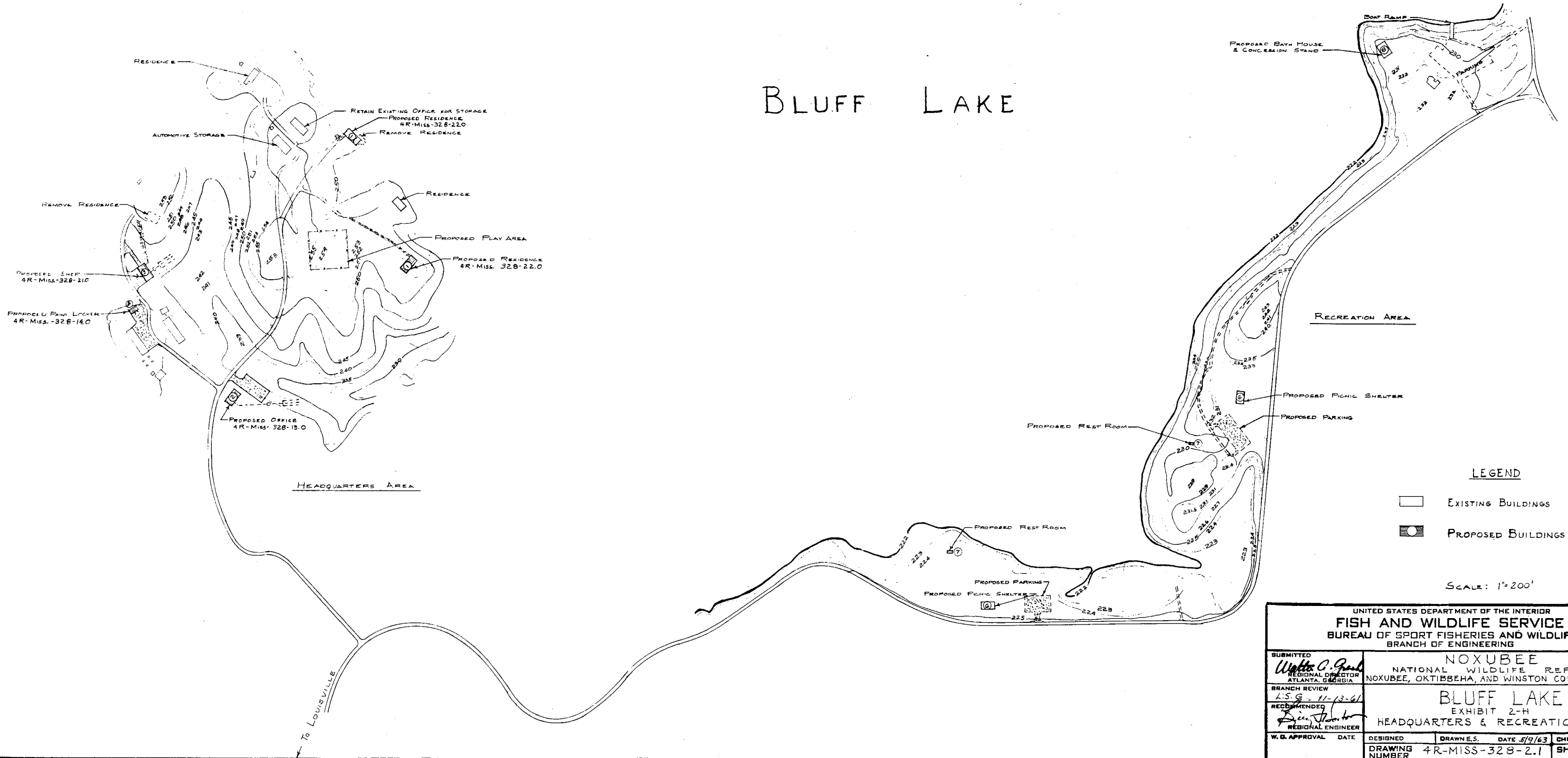
BASE MAP  
EXHIBIT 2A

DATE: 10-24-41  
DRAWING: 4-R-MISS-328-1  
NUMBER: 1



UNITED STATES DEPARTMENT OF THE INTERIOR			
FISH AND WILDLIFE SERVICE			
BUREAU OF SPORT FISHERIES AND WILDLIFE			
BRANCH OF ENGINEERING			
SUBMITTED <i>Chas. C. Gresh</i> REGIONAL DIRECTOR ATLANTA, GEORGIA	NOXURREE NATIONAL WILDLIFE REFUGE MASTER DEVELOPMENT PLAN NOXURREE COUNTY, MISSISSIPPI		
BRANCH REVIEW L.S.G. 10-4-61	TYPICAL EARTHWORK CROSS SECTIONS		
RECOMMENDED <i>Frederick J. Schmitt</i> REGIONAL ENGINEER	EXHIBIT 2-F ROADS AND DIKES		
W. D. APPROVAL DATE	DESIGNED	DRAWN C.E.H. DATE	CHECKED
	DRAWING NUMBER	4 R-MISS-323-4.1	SHEET 1 OF 1

BLUFF LAKE

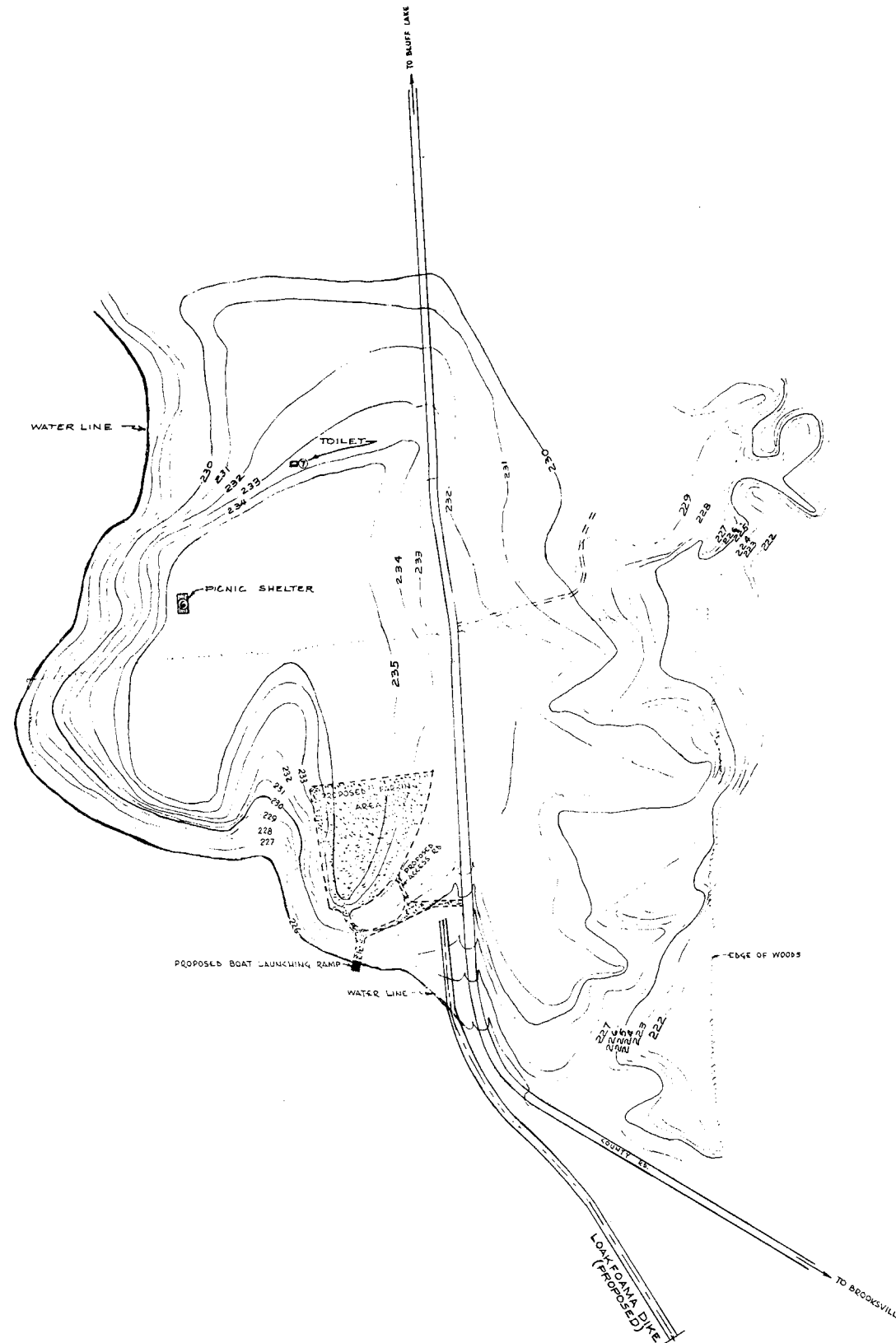


LEGEND

- EXISTING BUILDINGS
- PROPOSED BUILDINGS

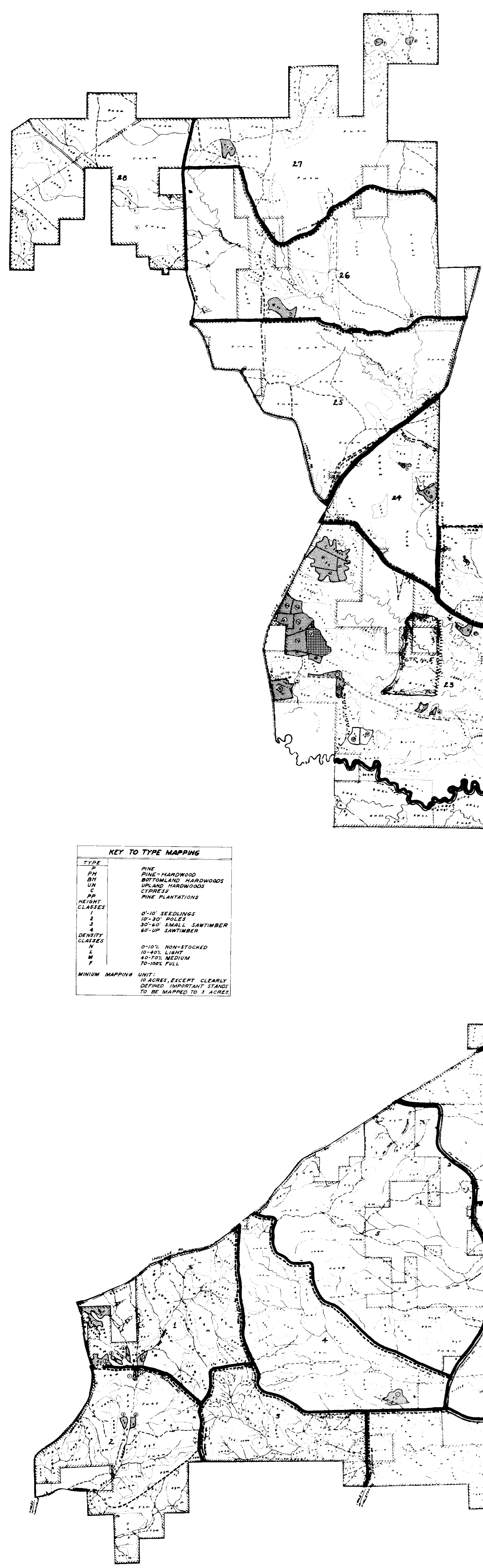
SCALE: 1"=200'

UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE BUREAU OF SPORT FISHERIES AND WILDLIFE BRANCH OF ENGINEERING			
SUBMITTED <i>Walter C. Paul</i> REGIONAL DIRECTOR ATLANTA, GEORGIA		NOXUBEE NATIONAL WILDLIFE REFUGE NOXUBEE, OKTIBBEHA, AND WINSTON COUNTIES, MISS.	
BRANCH REVIEW L.S. 11-13-61		BLUFF LAKE EXHIBIT 2-H HEADQUARTERS & RECREATION AREA	
RECOMMENDED <i>Dee Shuman</i> REGIONAL ENGINEER			
W.B. APPROVAL	DATE	DESIGNED DRAWN E.S.	DATE 5/9/63 CHECKED
DRAWING NUMBER 4R-MISS-328-2.1		SHEET 1 OF 1	



SCALE: 1" = 200'

UNITED STATES DEPARTMENT OF THE INTERIOR			
FISH AND WILDLIFE SERVICE			
BUREAU OF SPORT FISHERIES AND WILDLIFE			
BRANCH OF ENGINEERING			
SUBMITTED <i>W. C. G. G. G.</i> REGIONAL DIRECTOR ATLANTA, GEORGIA		NOXUBEE NATIONAL WILDLIFE REFUGE	
BRANCH REVIEW <i>L. S. G.</i> RECOMMENDED <i>L. S. G.</i> REGIONAL ENGINEER		NOXUBEE COUNTY MISSISSIPPI	
W. D. APPROVAL DATE		RECREATION AREA NO. 2	
DESIGNED DATE		EXHIBIT 2-I	
DRAWN DATE		DRAWING NUMBER 4R-MISS-328-31	
CHECKED		SHEET 1 OF 1	



AGRICULTURAL MAJOR WILDLIFE USAGE				
COMPARTMENT	FIELD	WATERFOWL HABITAT AGRICULTURAL LAND PRESENT ACREAGE	WATERFOWL HABITAT AGRICULTURAL LAND PLANNED DEV. ACREAGE	UPLAND GAME HABITAT AGRI. LAND ACREAGE
1	12,14,15	0	0	38
2	12,15	0	0	0
3	12,15	0	0	0
4	12,15	0	0	0
5	12,15	0	0	0
6	12,15	0	0	0
7	12,15	0	0	0
8	12,15	0	0	0
9	12,15	0	0	0
10	12,15	0	0	0
11	12,15	0	0	0
12	12,15	0	0	0
13	12,15	0	0	0
14	12,15	0	0	0
15	12,15	0	0	0
16	12,15	0	0	0
17	12,15	0	0	0
18	12,15	0	0	0
19	12,15	0	0	0
20	12,15	0	0	0
21	12,15	0	0	0
22	12,15	0	0	0
23	12,15	0	0	0
24	12,15	0	0	0
25	12,15	0	0	0
26	12,15	0	0	0
27	12,15	0	0	0
28	12,15	0	0	0
TOTAL		896	370	397
GRAND TOTAL		2363		

AGRICULTURAL FIELDS			INDIVIDUAL FIELDS BY COMPARTMENTS		
COMPARTMENT	FIELD NO.	ACRES	COMPARTMENT	FIELD NO.	ACRES
1	1	20	14	15	28
2	2	2	15	16	28
3	3	2	16	17	28
4	4	2	17	18	28
5	5	2	18	19	28
6	6	2	19	20	28
7	7	2	20	21	28
8	8	2	21	22	28
9	9	2	22	23	28
10	10	2	23	24	28
11	11	2	24	25	28
12	12	2	25	26	28
13	13	2	26	27	28
14	14	2	27	28	28
15	15	2	28		28
16	16	2			28
17	17	2			28
18	18	2			28
19	19	2			28
20	20	2			28
21	21	2			28
22	22	2			28
23	23	2			28
24	24	2			28
25	25	2			28
26	26	2			28
27	27	2			28
28	28	2			28
TOTAL		308	TOTAL		308
GRAND TOTAL		2363	GRAND TOTAL		2363

KEY TO TYPE MAPPING	
TYPE	
PH	PINE-HARDWOOD
BH	BOTTOMLAND HARDWOODS
UH	UPLAND HARDWOODS
C	CYPRESS
PP	PINE PLANTATIONS
HEIGHT CLASSES	
1	0'-10' SEEDLINGS
2	10'-30' POLES
3	30'-60' SMALL SAWTIMBER
4	60'-UP SAWTIMBER
DENSITY CLASSES	
N	0-10% NON-STOCKED
L	10-40% LIGHT
M	40-70% MEDIUM
F	70-100% FULL
MINIMUM MAPPING	UNIT: 10 ACRES, EXCEPT CLEARLY DEFINED IMPORTANT STANDS TO BE MAPPED TO 1 ACRE

LEGEND

AGRICULTURAL LANDS, EXISTING, PROPOSED AND UPLAND GAME FOOD PLOTS.

AGRICULTURAL FIELD DEWATERING IMPOUNDMENTS

MAP SCALE 2"=1 MILE

UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF FISH AND WILDLIFE  
DIVISION OF ENGINEERING

NOXUBEE NWR  
LAND USE MAP  
SHEET 5A

DATE: 4-11-55  
DRAWN BY: J. H. HARRIS  
CHECKED BY: J. H. HARRIS